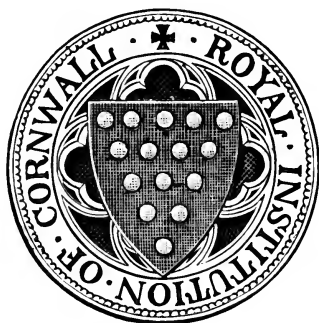


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JOURNAL

OF THE

/// Royal Institution of Cornwall.



VOLUME XII.

1893-4-5.

TRURO:
PRINTED BY LAKE AND LAKE, LTD., PRINCES STREET,
1896.

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Worth, T.	Lemon Street, Truro.
Wünsch, E. A., F.G.S.	Carharrack, Scorrier.

Subscribers to Illustration Fund.

Boase, G. C.	London.
Gilbert, C. Davies	Trelissick, Truro.
Harvey, Robert	1, Palace Gate, London, W.
Rashleigh, Jonathan	Menabilly, Par Station.
St. Levan, Lord	St. Michael's Mount.

Honorary Members.

Babington, Charles Cardale, M.A., F.R.S.	Cambridge.
Collins, J. H., F.G.S.	14 & 15, Broad Street Avenue, London, E.C.

Dickenson, Joseph, F.G.S.	..	South Bank, Pendleton, Manchester.
Maclean, Sir John, F.S.A., &c...	..	Glasbury House, Clifton.
Moissenet, Leon	.. .. .	Chaumont, Haute Marne, France.
Rowe, J. Brooking, F.L.S.	..	Castle Barbican, Plympton.
Whitley, H. Michell, F.G.S.	..	Trevella, Eastbourne.

Corresponding Members.

Dunkin, E. H. W.	.. .. .	5, Therapia Road, Forest Hill, Peckham, S.E.
Pattison, S. R., F.G.S.	.. .. .	5, Lindhurst Road, Hampstead, London, N.W.
Worth, R. N., F.G.S.	.. .. .	Plymouth.

Associates.

Clark, Thomas	.. .. .	Mitchell Hill Terrace, Truro.
Cole, Thomas, C.E.	.. .. .	Victoria Street, London.
Lobb, Thomas	.. .. .	Devoran.
James, J. H.	.. .. .	Truro Veian Terrace, Truro.
Michell, S. H.	.. .. .	Swansea.
Pearce, R., F.G.S.	.. .. .	Denver, Colorado, U.S.A.
Thomas, Josiah	.. .. .	Tregenna, Camborne.
Williams, R. H., F.G.S.	.. .. .	Cuddra, St. Austell.

The Honorary Secretaries will be obliged if the Members will notify errors or necessary alterations in this list.

The MUSEUM is open to *Members and their families* every day except Sunday, between the hours of Ten and Four o'clock during the winter, and between Ten and Five o'clock in the summer.

The Museum is open to the *public*, free of charge, on WEDNESDAYS, from Eleven until Four. On other days, an admission fee of sixpence is required.

A *Subscription of One Guinea* entitles the Subscriber to all the publications issued by the Institution, to admission to the Museum, for himself and family on every day in the week (except Sunday), and to the Meetings of the Society; and to ten transferable Tickets of admission to the Museum whenever open.

Royal Institution of Cornwall.

SPRING MEETING, 1893.

The Spring Meeting was held in the Society's Rooms at Truro, on the 1st of June, the President, Sir John Maclean, F.R.S.A., F.S.A., in the Chair.

In lieu of a formal address, Sir John made some remarks on subjects which were occupying the attention of the Council, and which would he hoped prove useful to the County in the interests of science. He had been informed that a suggestion had been made that the existing Scientific Societies should be more closely associated with each other, and he heartily commended such a scheme to their consideration. He was glad to be able to state that the Royal Institution of Cornwall was prosperous, and that the number of its members was well maintained. In the place of their former curator, Mr. Crowther (who had obtained an appointment in the North of England), they had found an able successor, Mr. Gregg, who would, he felt sure, carry on efficiently the various branches of work already in progress.

The Society had sustained a great loss by the death of Dr. Jago, F.R.S., who had filled the highest offices in the Society, and had, for a very great number of years, taken an active interest in its welfare.

ASSOCIATION OF CORNISH SOCIETIES.

Mr. Wünsch, F.G.S., at the request of the President, detailed the proposals affecting the joint action which might be taken by the Scientific Societies of the County. He said there was no actual scheme in existence, but the matter would be discussed at an early meeting of the Council. Something might be done on the principle of the British Association. Members of the different Societies might meet once a year in friendly intercourse to read and discuss papers, and it was thought that the forthcoming Fisheries Exhibition would be a suitable time for such a gathering.

He moved, and Mr. J. D. Enys, F.G.S., seconded, that the matter be left in the hands of the Council.

This was carried, Mr. Howard Fox, F.G.S., having pointed out that there would be no amalgamation of officers and funds.

Mr. J. H. Collins, F.G.S., contributed a further portion of his valuable series of papers "On the Origin and Development of Ore Deposits in the West of England."

Mr. Vallentin sent a paper entitled, "Remarks on Pelagic Life in and near Falmouth Harbour, with additions to the Fauna of the District."

[These Papers, and an Obituary Notice of Dr. Jago, F.R.S., will be found printed in Part 39 of the Journal, see Vol. XI.]

It was announced at the Meeting, that many presents to the Museum and Library had been received from the President and other friends.

Votes of thanks were accorded to the Chairman, donors of gifts and contributors of papers.

FIRST JOINT MEETING OF THE CORNISH SCIENTIFIC SOCIETIES.

On Thursday, the 27th of July, 1893, in accordance with resolutions previously adopted at a preliminary meeting of members of the several Societies, the first associated meeting (for the reading and discussing of papers contributed by approved representatives of each) was holden in the R.I.C. Museum Buildings at Truro, the following Societies acting in unison :

- (A) The Royal Geological Society of Cornwall (founded 1814).
- (B) The Royal Institution of Cornwall („ 1818).
- (C) The Royal Cornwall Polytechnic Society („ 1833).
- (D) The Mining Association and Institute of Cornwall, (founded 1860*-77-84.)

The Rev. Canon Moor, M.A., M.R.A.S., F.R.G.S., presided, and there was a large attendance.

The following Papers were read :

- (1). "On the Union of the Scientific Societies of New Zealand."—by Mr. J. D. Enys, F.G.S. (for the R.I.C.)
- (2). "On the Geology of Mullion Island."—by Mr. Howard Fox, F.G.S. (as President of the R.G.S.C.)
- (3). "On the New Californian Stamps at Dolcoath,"—by Capt. Josiah Thomas (manager of Dolcoath Mine, and representative of the Mining Association and Institute of Cornwall).
- (4). "On the Climate of West Cornwall,"—by Mr. Kitto, F.R.Met.S. (on behalf of the R.C. Polytechnic Society).

These four Papers will be found printed in the present issue. In the evening, Mr. H. Fox, F.G.S. and Mr. Thomas (Sec. Mining A. & I. of C.) explained and exhibited a series of interesting slides by limelight, shewing micro-photographs of Cherts, Radiolaria, &c., kindly lent by Mr. Teall, F.R.S. Thanks were rendered to the readers, and it was subsequently arranged that the next Associated Meeting of the Societies should be held at Penzance.

* See Bibliotheca Cornub., pp. 981, 1238, &c.

AWARD OF THE HENWOOD GOLD MEDAL, 1893.

A Special Meeting of the Council of the Royal Institution of Cornwall was held on Thursday afternoon, June 29th, 1893, in the Museum Buildings, at Truro, for the purpose of awarding the Gold Medal, bequeathed by the late Mr. William Jory Henwood, F.R.S., one of the former presidents. According to his will a triennial gold medal of considerable value is given for scientific literature relating to certain specified subjects connected with Cornwall.

In order to proceed to an award, at least seven members must attend a meeting convened for that purpose, and on this occasion there were twelve present. Rev. W. Iago, B.A., a past President, to whom the first gold medal was awarded three years ago for archæology, was called upon to preside; there being present also the Ven Archdeacon Cornish, M.A., Chancellor Paul, M.A., Canon Moor, M.A., M.R.A.S., and Rev. A. R. Tomlinson, M.A., Messrs. J. D. Enys, F.G.S., Howard Fox, F.G.S., H. James, A. P. Nix, Thurstan C. Peter, E. A. Wünsch, F.G.S., and Major Parkyn, F.G.S., hon. secretary.

The various papers on scientific subjects published in the journal of the Society during the last three years having been considered, a ballot was taken, with the result that the gold medal for 1893 was awarded to Mr. Joseph Henry Collins, F.G.S., for his recent contribution "On the Origin and Development of Ore Deposits in the West of England." Mr. Collins is well known in Cornwall, having held the county appointment of Public Analyst. He was one of the hon. secretaries of the Royal Institution of Cornwall and editor of its journal, hon. secretary of the Royal Cornwall Polytechnic Society, founder of the Mineralogical Society of Great Britain and Ireland, lecturer and assistant secretary of the Miners' Association of Cornwall and Devon, and has written and edited a great variety of works on practical and theoretical geology and other matters connected with Cornwall, its mineral industries, and early history. He has had considerable opportunities for observations in Cornish

and other mines, and as analyst at the Rio Tinto mines in Spain, &c. He is head of the firm of J. H. Collins & Sons, mining and metallurgical engineers, Broad Street Avenue, London, E.C.

There were many other papers, in the recent number of the Journal of the Royal Institution of Cornwall, on different branches of science, which were regarded as being of special interest, but Mr Collins's literary composition dealing as it did with no less than three of the subjects available in the competition, viz.: geology, mineralogy, and mining, was regarded by the great majority of the Council as the leading treatise issued, under the auspices of the society, during the last triennial period. The valuable record of the observations of another geologist, Mr. Thomas Clark, M.M.S., of Truro, on the Magnetic and other Rocks of Cornwall, was very highly appreciated; and it was resolved by the Council that his papers should receive honourable mention, and that he should be invited to become an Associate of the Society.

Sir J. Maclean, F.S.A., the president, had written stating his inability to attend.

Royal Institution of Cornwall.

ANNUAL AUTUMN MEETING, 1893.

PRESENTATION OF THE HENWOOD GOLD MEDAL.

The Annual Meeting was held at Truro, on Tuesday, November 28th. The Rev. W. Iago presided at the commencement of the proceedings, and the attendance included Messrs. J. D. Enys, F.G.S., Howard Fox, F.G.S. (President Royal Cornwall Geological Society), E. A. Wunsch, F.G.S., J. H. Collins, F.G.S., Ven. Archdeacon Cornish, M.A., Revs. Canon Moor, M.A., Canon Bourke, M.A., Chancellor Worledge, M.A., Canon Moore, M.A., Messrs. J. G. Chilcott, B. Williams, F. H. Davey, A. Blenkinsop, S. W. Sara, Stephen Rogers, F.G.S., G. B. Millett (Secretary Royal Cornwall Geological Society), James Paull, Robert Fox, W. G. N. Earthy, W. J. Clyma, A. P. Nix (Treasurer), J. T. Letcher, Edward Kitto, F.R.Met.S., (Secretary Royal Cornwall Polytechnic Society), H. Barrett, H. James, T. L. Dorrington, T. Clark, R. A. Gregg (Curator), The Hon. Mrs. Gilbert, Miss Enys, Mrs. and Miss Paull, Mrs. H. James, Miss F. James, Miss C. Carlyon, Mrs. & Miss Share, The Misses Tomlin, Mrs. Gregg, Miss Clyma, &c. Letters of regret at inability to be present were read from Sir John Maclean, F.S.A. (President), Major Parkyn, F.G.S. (one of the Hon. Secs.), the High Sheriff of Cornwall (Mr. W. Bolitho, Jun.), Lord St. Levan, Rev. A. R. Tomlinson, Rev. C. F. Rogers, and Mr. W. E. Baily.

The Council presented their annual report, which was adopted; it was as follows:—

REPORT.

The Council, in presenting the 75th Annual Report, observe with pleasure the continued prosperity of the Institution. The number of members is well sustained and no loss by death has occurred during the past year.

The interest of the public in the Museum has not declined, as the following return, giving the number of visitors, will show :

Admitted free	2733
Members and friends	180
By payment	449
	<hr/>
	3,362

The Henwood Gold Medal was awarded, in accordance with the terms of the will of the donor, at a very fully attended Council Meeting on the 29th of June last, to Mr. Joseph Henry Collins, F.G.S., for his able essay on "The Origin and Development of Ore Deposits in the West of England." The paper (which is a continuation of a former series) had been published in the eleventh volume of the Journal, and was adjudged to be the best which had appeared, during the last triennial period, on either of the eight specified subjects for which the medal was offered. The presentation of the medal to Mr. Collins will take place in the course of to-day's proceedings.

The papers by Mr. Thomas Clark on "The Magnetic Rocks of Cornwall," were also highly commended, and it is proposed that he be elected an Associate of the Institution.

In the Museum Mr. Gregg, the Curator, has continued the work of arranging the minerals, commenced by Mr. Crowther, his predecessor. The very valuable collection given by Mr. J. C. Williams, M.P., has been temporarily placed in the upright cases in the geological room, but they cannot be adequately displayed until extra space for them is provided.

In the Antiquity room, the cases have been completely re-arranged, and labels which had become indistinct have been replaced by new ones written in Indian ink.

In the Natural History collection, wire brackets, designed by the Curator, have been substituted for those of wood, where necessary, in the bird cases.

Many of the stuffed birds are in poor condition, having been in their present positions for a number of years. The Council will therefore be glad to receive specimens from members and friends to replace those which are defective.

Several pieces of scientific apparatus, which were incomplete or out of order, have been repaired by the Curator, and are now available for use. The telescope is still in Mr. H. M. Whitley's care, and it is understood that he has had some improvements made in it.

The Meteorological observations have been taken, and forwarded to the Registrar General, as usual, and a Weather report has been supplied each month to the Sanitary Committee of the County Council and also to the local papers.

The classes formed last winter by Mr. Crowther were continued to the close of the session by Messrs. Snell, Bate, and Olver, with satisfactory results. This year a scheme for systematic instruction in science has been elaborated, and there are now being held in Truro not less than 14 classes, of which those in Chemistry, Geology and Physics are taught by Mr. Gregg in the laboratory of this Institution.

On the 27th of July a very interesting meeting was held in these rooms, in accordance with resolutions previously passed, bringing into close association the various Scientific Societies of the County. The Rev. Canon Moor, M.R.A.S., presided. Mr. Enys, F.G.S., on behalf of this Institution, read an introductory paper on "The Amalgamation of Scientific Societies in New Zealand." This was followed by other valuable papers read by Mr. Howard Fox, F.G.S., President of the Royal Geological Society of Cornwall, Capt. Josiah Thomas, representing the Mining Association and Institute of Cornwall, and Mr. Kitto, on behalf of the Royal Cornwall Polytechnic Society. The papers will all be found printed in the current number of the Society's Journal, the subjects dealt with being of great importance to Cornwall.

The legacy bequeathed by the late Miss Curgenven has been received, and the financial statement, furnished by the Treasurer, will be found appended to this report.

Many gifts have been presented to the Museum, a list of which is also added. Some of them claim special mention here. Besides the great collection of valuable minerals kindly forwarded by Mr. J. C. Williams, of Caerhays Castle, to which allusion has already been made, the society has received from Mr. J.

Langdon Bonython of Australia, another good collection, which includes some fine specimens of cerrusite, malachite, and native copper from the Broken Hills and Burra Burra Mines. These have been separately arranged in a case in the geological room, as typical of Australian ores. Mr. T. V. Keam of Keam's Canon, Arizona, U.S., has contributed various articles of American Indian manufacture, consisting of silver ornaments made from American coins, a number of basket work plaques, a girdle, and a loom with a partly-made fabric, illustrating the implements used and the method employed in weaving the famed Navajo blankets. This collection has also been placed in a case by itself. The late Miss M. S. Tucker, formerly of Trematon Castle, presented, a few days before her death, an elegant little box inlaid with a finely executed mosaic, which was given to Capt. Murray, R.N., by Cardinal Antonelli, for conveying him in his ship to Portugal on a political embassy.

Mrs. Enys of Enys gave a specimen of mediæval pottery, part of a rude still which was used in St. Just. It formed part of the Borlase collection, and was purchased at the Laregan sale in 1887.

Miss S. A. C. Whitford of Truro, is the donor of a beautifully embroidered silk waistcoat, in good preservation, worn by Sir Michael Nowell, Kt., of Penwarne, Mawnan, near Falmouth, High Sheriff of Cornwall in 1786; the exquisitely worked flowers and other devices being interspersed with imitation gems. It has been placed under glass in a suitable frame.

Mrs. Jago, of Truro, has made a very acceptable addition to the series of portraits of Past Presidents, by presenting an excellent likeness of her late husband, Dr. Jago, F.R.S., for many years a most useful member of this society.

The Council having served the appointed time, must now ask this meeting to proceed to a fresh election.

Sir John Maclean, F.S.A., has filled the office of President for the last two years, and therefore retires, the other members of the council being grateful to him for his services. They have much pleasure in proposing, as President for the next two years, Mr. John Davies Enys, F.G.S., who is well qualified, and has already been a benefactor of the society. They further nominate the following to hold office during the ensuing year :

As Vice-Presidents :

THE VEN. ARCHDEACON CORNISH, M.A.	REV. W. IAGO, B.A.
REV. CANON MOOR, M.A., M.R.A.S., F.R.G.S.	MR. EDWIN DUNKIN, F.R.S., F.R.A.S.
	SIR JOHN MACLEAN, F.S.A., F.R.S.A.

As other Members of the Council :

MR. W. E. BAILY.	MR. THURSTAN C. PETER.
MR. HOWARD FOX, F.G.S.	REV. A. R. TOMLINSON, M.A.
MR. HAMILTON JAMES.	MR. ROBERT TWEEDY.
MR. F. W. MICHELL, C.E.	REV. D. G. WHITLEY.
CHANCELLOR PAUL, M.A.	MR. E. A. WÜNSCH, F.G.S.

Treasurer :—MR. A. P. NIX.

Hon. Secs. :—MAJOR PARKYN, F.G.S. and MR. J. D. ENYS, F.G.S.

As Editor of the Journal, Mr. H. Michell Whitley has intimated his inability to continue in office, through a pressure of other engagements as well as his non-residence in the county.

The Rev. W. Iago has been nominated to succeed him, his knowledge and experience eminently qualifying him for the office. Mr. Iago is willing to act, in co-operation with Major Parkyn, who, for many years past, has, with him and in association with the editor, carried on locally much of the work connected with the preparation of the Journal.

The Council desire to acknowledge their obligation to Mr. Whitley for the care and attention he has freely bestowed upon the important duties entrusted to him, and the admirable manner in which they have been carried out, and they have great pleasure in proposing that he be elected an Honorary member.

GIFTS TO THE LIBRARY.

The Succession of the Plymouth Devonian	} Mr. R. N. Worth, F.G.S.
Fourteenth Report of the Barrow Committee	
Notes on Roman Devon	
On The Batten Skull in the Plymouth Museum	
Materials for a Census of Devonian Granites and Felsites	
Suggested Identification of the Domesday Manors of Devon	
Technical Education from a Polytechnic Standpoint	
The Stone Rows of Dartmoor	} Mr. J. H. Collins, F.G.S.
The Palæozoic Fossils of Cornwall	

Annual Report, School of Mines, South Australia...	Mr. J. Langdon Bonython.
Roman Inscriptions in Britain, Part II	Mr. F. Haverfield, M.A., F.S.A.
Annals of the Cape Observatory, Vol I, parts 2 & 4 Greenwich Observations, 1890	The Lords Commissioners of the Admiralty.
Letters from Queensland	
Larvæ of the British Butterflies and Moths	Agent General for Queensland.
Articles of an Association formed at Bodmin for the prosecution of thieves, &c.	Mr. Will Buckler.
Experiment on Wheat sown in October, 1801, by Rev. Robert Walker of St. Winnoe	Sir John Maclean, F.S.A.
MS. of Horses entered for Bodmin Races, from 1819 to 1823	
Description of the Remains of the Megalichthys in the Leeds Museum	
Portrait of the late James Jago, M.D., F.R.S. ...	Mr. Crowther.
Abridgments of Specifications	Mrs. Jago.
Summaries of Reports of H. M. Inspectors of Mines	Patent Office, London
Handy Guide to Chemical and Physical Apparatus	Prof. C. Le Neve Foster, D.Sc., B.A.
Bulletins of United States National Museum... ..	Messrs. Reynolds & Branson, Leeds.
Proceedings ,, ,, ,,	The Government of U.S. of America.
Victoria Year book, Vols. 1 and 2.	
The Diamond Prospecting Core Drill	Government of Victoria.
The South Australian School of Mines and Technical Museum Annual Report	Mr. Stephen Rogers.
United States Geological Survey, 11th Annual Report	The Agent-General of South Australia.
Official Guide to the Cornwall County Fisheries Exhibition	Government of U.S. of America.
On the Nature of the Chemical Elements	Mr. E. W. Rashleigh
On some evidences of the Formation of Ore Deposits by Lateral Secretion in "John Jay" Mine Providence, Colorado	
Geological Survey of Canada	Colorado Scientific Society.
Portrait of the late Mr. Henwood, F.R.S., &c. ...	

Mr. J.D. Enys, F.G.S.

GIFTS TO THE MUSEUM.

Eurynome Aspera	}	Mr. Rupert Vallentin.
Pectenaria, from Granton. June, 1887		
Munida Rondelletti		
Pentacta pentaches (Agass) found under a stone at low water near Falmouth Castle, sea side, 23rd May 1888		
Porturas Corrugatus with Ova, Falmouth Harbour, 6th February, 1891		
Nictiphanes norvegica, from the Clyde	}	Mr. Edward Burton.
Nictiphanes couchii, Falmouth Harbour		
Rook with horny excrescence on its back, shot by Sir Fred. Martin Williams, Goonvrea	}	Miss A. Houghton, Falmouth.
Biscobra		
Blowpipes with quivers of poisoned arrows from the Malay Peninsula	}	Capt. James Roberts, Pahang.
Native Bags from the Malay Peninsula		
Bundle of Cane do.		
Snare for Wild Fowl do.		
Raw Guttapercha do.		
Native money (now obsolete) do.		
Bills of Hornbill do.		
Deer Horn do.		
Opium Pipe with accessories do.	}	Mr. T. Clark.
Rock specimens and sections for the Microscope		
Shark's Tooth in Chalk	}	Mr. Sam. B. Rosevear.
Belemnite in Flint Nodule		
Trochus Imperialis, New Zealand	Mr. John D. Enys, F.G.S.	
A Number of Foreign Coins	Capt. James Roberts Pahang.	
Stone originally used as a Mortar in which tin stuff was pounded	}	Mr. Edward Oke, St. Columb.
Larva of Privet Moth in Spirit		
Specimens of Coral	}	Mrs. Sharp, London.
Terra Cotta Vase		
Looe Trout	Capt. Rogers, R.A., Penrose.	
Salmon Peel	Col. Rashleigh.	
Cross between Herring and Pilchard	}	Mr. J. D. Enys, F.G.S.
Mineral Specimens from New Zealand		

Specimen of late Mediaeval Pottery... ..	Mrs. Enys.
Nepheline Phonolite from the Wolf Rock	Mr. T. Clark.
Norwegian Coins	Mr. Howard Fox.
Collection of Minerals from the Broken Hills Mines, } N.S. Wales, and Burra Burra Mines, South } Australia	Mr. J. Langdon Bonython.
Mosaic, by Berberi, presented by Cardinal Antonelli } to Capt. Murray, R.N.	Miss Mary Sophie Tucker.
Nest of Tree Wasps (<i>Vespa Norvegica</i>) found near } Truro, 4th July, 1893	Mr. Hamilton James
1 Silver Belt, 2 Pair Earrings, 1 Necklace, 1 } Crescent, 7 Bracelets, 1 Ring, 22 Buttons, made } from American Silver Coins by Navajo } Indians; 1 Navajo Loom, with part of Blanket. } 6 Plaques and 1 Girdle made by Moque Indians }	Mr. T. V. Keam, Keam's Canon, Arizona.
Silk Embroidered Waistcoat, worn by Sir Michael } Nowell, Kt., High Sheriff of Cornwall	Miss S. A. C. Whitford.

The Rev. W. Iago then vacated the chair in favour of Mr. J. D. Enys, and said it was only right that someone should express the satisfaction which the Institution felt in seeing Mr. Enys in the chair. They were sorry Sir John Maclean was not there to induct Mr. Enys as his successor; but Mr. Enys was so well known that he needed no introduction. His scientific attainments and his interest in all matters undertaken by the Royal Institution connected with the intellectual welfare of the county were well-known, not only locally, but even in other countries. They were pleased to see Mr. Enys amongst them, and would be most happy to serve under him as president.

Mr. Enys said he desired most sincerely to thank the members of the council for the kind way in which they had proposed him as president, and he only hoped his conduct during his presidency would fulfil their anticipation. No address was expected from him on that occasion, but he would make a few observations:—

Mr. Iago had taken up the subject of stone inscriptions, and had read many interesting papers on Cornwall, and Mr. Collins had treated of the mineral veins of the County. Many other interesting subjects might be taken up, and the more they appreciated the benefits of the Institution, and the larger the number of papers they could have, the better it would be. He hoped many members would come forward and help with papers.

His first duty as president was one which afforded him great pleasure, and that was to hand to Mr. J. H. Collins the medal awarded to him by a full meeting of the Council, after careful consideration of the papers sent in. Under the will of the late Mr. Henwood, a certain sum of money was left, to be devoted every three years to having a medal struck, of a certain value, to be presented for the paper considered by the Council to be the best published in the Transactions of the Institution during the previous three years. The paper of Mr. Collins, to which the medal had been awarded, was the third of a series. The Council were mindful of the fact that it was a continuation of other papers, but the medal was awarded for that paper only which had been published during the last three years. It struck him as a happy coincidence that the paper of Mr. Collins was a continuation or carrying on of the work to which Mr. Henwood devoted a considerable portion of his life, and which dealt with the mineral veins of Cornwall. That was considered classic, and contained information and references which were not now obtainable from any other source. Mr. Henwood traversed many countries, and a vast distance underground ; what he wrote was the result of personal observation, and his writings could never be superseded. His treatise was the standard work on Cornish mining and veins. Mr. Collins had continued that work which he had carried so far, and it was a great pleasure to him (Mr. Enys), as the first act of his presidency, to hand Mr. Collins the Henwood Gold Medal. He hoped Mr. Collins might be able—now he was again resident in England—to come more often amongst them. They would always have pleasure in welcoming him, and would, he had no doubt, be benefitted by his assistance and researches. [The Medal was then presented].

Mr. E. A. Wünsch said he considered it a great privilege to be allowed to speak in endorsement of what the president had said. He thought he might congratulate the Institution on the choice of their new President. It was a particularly happy circumstance in connection with that presentation that they had recently assisted at a meeting of the Royal Geological Society, where Mr. Fox delivered an address which must have aroused geologists, and would he hoped rouse the members of that Institution generally to greater exertion. Mr. Henwood devoted

many years of indefatigable research to the investigation of Cornish mines. He traversed an immense distance underground—2,000 miles, it was said—sometimes at the peril of his life, and he had left a record of his researches in two volumes of the *Transactions at Penzance*. This was a noble example, and it was no easy matter to find a successor of Henwood; but they had found one in the person of Mr. Collins. The mantle of Mr. Henwood had fallen on Mr. Collins.

Mr. Howard Fox said he was delighted to see Mr. Enys filling the Presidential chair. His grandfather was one of two Cornishmen who became President of the Royal Society, and it was extremely gratifying that a descendant should have devoted his life and interest so much to geology, archæology, and various branches of science as to attain to the presidency of that institution. Referring to Mr. Collins, Mr. Fox said he had the same untiring energy and indomitable perseverance which characterised Mr. Henwood, and he had ascended higher, perhaps, than Mr. Henwood had attempted to do. Mr. Henwood, in his writings, said that he purposely abstained from any theoretical speculation; that he did not allow himself to inquire into the causes of the phenomena which he brought into order. Mr. Collins had dared to make very bold deductions, and by so doing had challenged the world to criticise his views. As far as he (Mr. Fox) was aware, the balance of scientific opinion, year by year, tended more and more to Mr. Collins's side on those points about which there was the greatest controversy just after they were published. As an old friend, and a pupil of Mr. Collins, it would have grieved him (Mr. Fox) very much if he could not have had an opportunity of being present on that occasion.

The Rev. W. Iago added his congratulations to those of the preceding speakers. He had known Mr. Collins for many years in connection with that Institution, and had read his papers. Mr. Collins had been one of their valued secretaries, and had conducted their excursions with so much care and kindness, and had so well attended to their interests as a society that they owed him a debt of gratitude. Whilst congratulating Mr. Collins, they felt that there was a peculiar fitness in his receiving the medal, for he knew the late Mr. Henwood so well, that they were sure Mr. Henwood—in the esteem he had for Mr. Collins

—would have been gratified at his being the recipient of the medal. Having referred to the fact that Mr. Collins and himself—the only winners of the medal so far—were Londoners, who had received it for archæology, and geology, Mr. Iago said it was time some other branch of science should be brought forward, and he hoped they would see those who were Cornishmen, and who studied other subjects, rewarded on future occasions.

Mr. Collins said he desired most heartily to thank the Council for the handsome recognition they had made of his work. No one knew as well as himself how imperfect that work was ; it had been carried on for a long time. Twenty-five years ago, and more, he began to study the geology of Cornwall, and he thought it was likely he should continue it as long as he was able to work at anything. He knew how wide was the field and how much work there was to be done. It was particularly pleasing to him to find that the friends with whom he had worked, so many years, so far recognised his work as to give him that medal, which he highly valued. He believed if Mr. Henwood had been present he would have had his sympathy. If in following Mr. Henwood he had ventured to speculate, it was largely because he had been able to use the tools which Mr. Henwood left. Mr. Henwood's work was that of collecting and ordinating facts ; as the initiator of these particular investigations Mr. Henwood was obliged to keep away from speculation and theory, and deal with facts. In following him, he (Mr. Collins) was equally obliged to take up speculation, and, although in dealing with such a subject a man must make mistakes, it was possible that he would arrive at some conclusions which would be accepted by his fellows.

Mr. Enys then presented to the Institution a portrait in oils of the late Mr. Henwood. It was said to be the only painting of Henwood. It was by Pentreath, of Penzance, and was considered by those who knew Mr. Henwood, to be a good likeness.

The Rev. W. Iago read two papers—one on the “Twelve Roman Inscriptions at Prideaux Place” (Padstow), and the other on “The Lost Bell of St. Petroc, used by the Anglo-Saxon Duke and Duchess of Cornwall.”

Alderman Dorrington proposed a vote of thanks to Mr. Iago for his papers; to the donors to the museum and library; and to the President for the portrait of Mr. Henwood.

Canon Moor, in seconding, congratulated Mr. Enys on his election to the presidential chair, and referred to the deep interest which Mr. Enys's grandfather, Mr. Davies Gilbert, together with Sir Charles Lemon and others, took in the Institution and other local movements. Having acknowledged the Institution's indebtedness to Mr. Iago, Canon Moor expressed his sincere regret at the absence of their admirable secretary, Major Parkyn. In Major Parkyn's absence he felt free to say more than he could say to his face in reference to the wonderful benefit which his secretariat had been to the Institution. With great patience and untiring energy, he had fulfilled the duties of his office—often very onerous duties—and they owed him more than they could express for all that he had done. Canon Moor also made kindly allusions to Mr. H. Michell Whitley, who had been Major Parkyn's colleague in the secretariat for many years, and had just resigned the position. He had ably and thoroughly followed in the steps of his father, Mr. N. Whitley, and was a valuable and valued friend of the Institution.

The resolution was carried, and briefly acknowledged by the President.

Mr. Iago mentioned that the Council, in adjudicating on the papers sent in for the medal, regarded that written by Mr. Thomas Clark as being worthy of mention with special commendation; and in recognition of it they had resolved to make Mr. Clark an Associate.

This concluded the proceedings.

Dr. Mr. A. P. Dix, Hon. Treas. in account with the Royal Institution of Cornwall. Cr.

1892		1893		1893		1893		1893		1893		1893	
July 31st.		July 31st.		July 31st.		July 31st.		July 31st.		July 31st.		July 31st.	
£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	
To balance	25 14 9	...	...	...	...	By Curator ...	...	...	...	59 3 11	...
„ Interest on Deposit Notes	„ Fire Insurance...	...	...	...	2 14 0	...
„ H.R.H. Prince of Wales	„ Taxes ...	...	...	...	1 10 0	...
„ Subscriptions	145 17 0	...	...	...	...	„ Printing : Journal, &c.	...	...	...	99 18 4	...
„ Visitors' Fees	10 6 3	...	...	...	...	„ Magazines, &c.	...	...	...	4 9 6	...
„ Sale of Journals	2 9 0	...	...	...	...	„ Renewals and Repairs	...	...	...	22 8 11	...
„ Sundry Receipts	1 1 0	...	...	...	...	„ Museum Expenses	...	...	...	24 14 11	...
„ Technical Education Committee	2 15 5	...	...	...	...	„ Fuel and Gas ...	...	...	...	6 18 2	...
„ Excursion	17 12 6	...	...	...	...	„ Sundries	...	...	...	15 11 8	...
								„ Excursion	...	...	...	13 4 4	...
								Balance	...	...	...	5 11 2	...

*Summary of Meteorological Observations at Truro, in Lat. 50° 17' N., Long. 5° 4 W., for the year 1893,
from Registers kept at the Royal Institution of Cornwall.*

TABLE No. 1.

1893.	MONTHLY MEANS OF THE BAROMETER. Cistern 43 feet above mean sea level.																	
Month.	Mean pressure corrected to 32 deg. Fahr. at sea level.			Mean of monthly means.	Mean correction for diurnal range.	True mean of monthly means.	Mean force of vapour.	Mean pressure of dry air.	Corrected absolute maximum.	Day.	Corrected absolute minimum.	Day.	Extreme range for the month.	Mean diurnal range.	Greatest range from 9 a.m. to 9 p.m.	Day.	Greatest range in any 24 consecutive hours.	Between which days it occurred.
	9 a.m.	3 p.m.	9 p.m.															
January	ins. 30.099	ins. 30.095	ins. 30.104	ins. 30.099	in. .004	ins. 30.095	in. .236	ins. 29.861	ins. 30.606	21	ins. 29.466	8	ins. 1.240	in. .099	in. .26	31	in. .50	9 & 10
February	29.742	29.731	29.731	29.733	.003	29.730	.279	29.454	30.318	7	29.028	26	1.290	.110	.50	20	.65	27 & 28
March	30.165	30.161	30.161	30.161	.007	30.154	.299	29.862	30.464	8	29.713	1	.751	.060	.19	1	.48	1 & 2
April	30.109	30.101	30.134	30.112	.004	30.108	.315	29.797	30.353	8	29.803	19	.550	.076	.57	20	.68	19 & 20
May	30.028	30.015	30.036	30.025	.003	30.022	.366	29.636	30.306	11	29.481	17	.825	.051	.17	21	.25	21 & 22
June	29.997	29.997	30.001	29.998	.001	29.997	.415	29.583	30.376	5	29.529	23	.847	.066	.17	3	.33	3 & 4
July	29.906	29.913	29.917	29.912	.002	29.910	.447	29.465	30.248	28	29.488	11	.760	.073	.20	21	.38	21 & 22
August	30.017	30.015	30.026	30.019	.004	30.015	.447	29.572	30.266	28	29.720	20	.546	.062	.17	21	.24	23 & 24
September	29.901	29.880	29.890	29.890	.004	29.886	.355	29.535	30.307	14	29.345	29	.962	.090	.33	28	.49	27 & 28
October	29.937	29.921	29.931	29.929	.006	29.923	.335	29.594	30.456	23	29.256	4	1.200	.086	.17	13	.36	17 & 18
November	30.034	30.004	30.040	30.026	.004	30.022	.254	29.772	30.466	21	29.249	17	1.217	.149	.82	26	.84	25 & 26
December	29.977	29.984	30.014	29.991	.003	29.998	.243	29.748	30.658	29	29.000	20	1.658	.136	.44	20	.91	13 & 14
Means	29.992	29.984	29.998	29.991	.003	29.987	.332	29.658	30.402		29.423		.987	.088	.332		.50	

REMARKS.—The Barometer used is a Standard, made by Barrow, and compared with the Standard Barometer at the Royal Observatory, Greenwich, by Mr. Glashier. The corrections for Index Error (+0.008), Capillarity (+0.109), height above sea (43 feet), and temperature, have been applied.

TABLE No. 2.

MONTHLY MEANS OF THE THERMOMETER

Month.	9 a.m.		3 p.m.		9 p.m.		MASON'S HYGROMETER.										SELF REGISTERING.						ABSOLUTE.				
	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Mean of Dry Bulb.	Mean correction for diurnal range.	True mean of Dry Bulb.	Mean of Wet Bulb.	Mean correction for diurnal range.	Mean temp. of evaporation.	Wet Therm. below dry.	Mean dew point.	Dew point below Dry Therm.	Mean of all the Maxima.	Mean of all the Minima.	Approximate mean temp.	Correction for the month.	Adopted mean temp.	Daily mean range.	Maximum.	Day.	Minimum.	Day.	Range.	
January	41.6	40.1	43.6	41.6	41.4	39.7	42.2	0.4	41.8	40.5	0.3	40.2	1.6	37.5	4.7	46.4	35.7	41.0	0	0	40.9	10.1	53	29	15	3	38
February	45.6	44.0	48.9	46.9	45.4	43.7	46.6	0.7	45.9	44.9	0.5	44.4	1.5	41.7	4.9	51.1	40.1	45.6	0.1	45.5	11.0	56	8	28	25	28	
March	50.5	47.4	54.9	50.3	50.6	47.4	52.0	1.0	51.0	48.4	0.6	47.8	3.2	43.9	8.1	57.8	38.2	48.0	0.2	47.8	19.6	67	29	27	11	40	
April	57.5	51.7	60.6	54.5	50.7	48.0	56.2	1.6	54.6	51.4	1.3	50.1	4.5	46.3	9.9	65.9	60.8	53.3	0.1	53.2	25.1	71	26	42	12	29	
May	60.0	55.0	60.9	55.9	53.2	51.7	58.0	2.3	55.7	54.2	1.4	52.8	2.9	50.4	7.6	66.2	48.0	57.2	0.8	56.4	18.2	74	28	39	8	35	
June	65.3	58.7	67.0	59.6	58.1	55.8	63.4	2.9	60.5	58.0	1.7	56.3	4.2	53.8	9.6	71.7	49.8	60.7	0.3	60.4	21.9	80	1	46	28	34	
July	64.5	59.8	66.3	60.8	60.3	58.3	63.7	2.1	61.6	59.6	1.2	58.4	3.2	55.9	7.8	70.0	56.8	63.4	0.3	63.1	13.2	80	1	46	28	34	
August	66.4	61.0	68.9	62.5	61.0	59.0	65.4	2.0	63.4	60.9	1.2	59.7	3.7	55.9	9.5	72.7	56.0	64.3	0.3	64.0	8.7	83	13	43	27	40	
September	60.2	55.5	62.3	56.2	54.4	22.4	59.0	1.7	57.3	54.7	0.9	53.8	3.5	49.5	9.5	65.9	50.3	58.1	0.2	57.9	15.6	76	3	38	24	38	
October	52.8	50.6	56.4	52.2	49.6	48.2	52.9	0.8	52.1	50.3	0.6	49.7	2.4	48.0	4.9	59.7	45.3	52.5	0.4	52.1	14.4	66	21	30	31	36	
November	45.4	43.0	47.4	44.2	44.7	42.3	45.8	0.6	45.2	43.2	0.5	42.7	2.5	40.7	5.1	50.7	40.4	45.5	0.1	45.4	10.3	60	3	27	1	33	
December	44.0	42.1	47.0	44.2	42.5	40.8	44.5	0.2	44.3	42.4	0.3	42.1	2.2	39.6	4.9	50.2	38.3	44.2	0.2	44.0	11.9	57	6	21	3	36	
Means	54.4	50.7	57.0	52.4	50.9	46.4	54.1	1.3	52.7	50.7	0.8	49.0	2.9	46.9	7.2	60.6	44.9	52.8	0.2	52.5	15.0	69.5	15.2	32.7	14.5	36.8	

The Thermometers are placed on the leaded roof of the Royal Institution in a wooden shed, through which the air passes freely. The Standard Wet and Dry Bulbs are by Negretti and Zambra, and have been corrected by Mr Glaisher.

TABLE No. 3.

1893.

WINDS.

Month.	E.	S.E.	S.	S.W.	W.	N.W.	N.	N.E.	AVERAGE FORCE.	Mean.																		
	9 a.m.	3 p.m.	9 p.m.	9 a.m.	3 p.m.	9 p.m.	9 a.m.	3 p.m.	9 p.m.																			
	—	—	1	3	8	9	6	1	2	3	5	5	6	5	3	3	8	8	7	1·9	2·0	2·3	2·0					
January	—	—	1	3	8	9	6	1	2	3	5	5	6	5	3	3	8	8	7	1·9	2·0	2·3	2·0					
February	1	1	1	2	14	15	16	4	3	2	2	3	4	4	2	1	1	1	1	2·0	2·0	2·0	2·0					
March ...	10	9	6	4	5	4	5	—	1	—	5	5	6	2	3	2	1	1	1	1·3	1·6	1·6	1·5					
April ...	6	5	8	12	2	1	2	—	—	1	1	3	4	4	2	1	6	4	4	1·5	1·6	1·0	1·3					
May ...	3	2	3	5	6	2	4	1	1	1	3	7	2	4	5	1	2	2	1	1·0	1·3	0·5	0·9					
June	6	3	—	5	5	—	—	5	5	2	4	6	3	2	2	2	1	—	—	1·1	1·0	0·5	0·8					
July	1	—	—	2	2	1	4	3	3	2	3	0	5	4	3	5	—	—	—	1·4	1·5	0·5	1·1					
August ...	1	2	1	5	4	—	5	3	3	7	7	3	4	6	1	4	3	1	—	1·4	1·4	0·5	1·1					
September	2	3	1	2	2	—	4	3	4	5	6	6	6	6	6	5	3	4	1	1·4	1·5	0·8	1·2					
October ...	1	1	—	0	—	—	2	6	3	9	6	7	3	7	2	3	5	7	—	1·1	1·5	1·1	1·2					
November	2	1	1	2	2	1	—	—	—	5	2	2	4	6	6	6	8	9	8	1·8	1·9	1·6	1·7					
December	—	—	—	1	2	1	5	2	4	10	10	3	3	6	3	4	4	3	3	1·7	1·5	0·9	1·3					
Total ...	33	27	18	38	46	11	22	22	21	72	68	54	35	47	30	48	67	47	52	44	31	34	29	26	17·6	18·8	13·3	16·1
Means ...	26·0			31·6			21·6			64·6			37·3			54·0			42·3			29·6			1·4	1·5	1·1	1·3

The force of the Wind is estimated on a scale from 0 to 6, from calm to violent storm.

TABLE 4.

1893.

WEATHER.

Month.	AVERAGE CLOUDINESS.				RAINFALL.				Mean weight of vapour in a cubic foot of air.	Mean additional weight required for saturation of the air.	Mean humidity of atmosphere.	Mean elastic force in in.	Mean weight in grains troy of a cubic foot of vapour.	SUN.			Dry.	Wet.	REMARKS.
	Rainfall in inches.			Greatest fall in 24 hours, Truro.	No. of days in which rain fell.	Depth.	Date.												
	9 a.m.	3 p.m.	9 p.m.					Mean.											
														Truro.	in.				
January	7.3	6.5	6.6	6.8	3.27	20	.58		2.6	0.5	85	.225	535.5	22	14	26	67	26	Fog, 19, 27. Snow, 14. Hail, 14. Frost, 1, 2, 3, 4, 11, 12, 15, 16, 21, 27. Gale, 14.
February	6.7	6.2	7.1	6.7	4.85	25	.83	25	3.1	0.5	86	.265	531.0	28	12	22	58	26	Hail, 11, 12, 21. Frost, 15, 26, 29, 29.
March ...	4.2	3.4	3.4	3.6	.17	8	.06	16	3.3	1.1	74	.287	524.7	51	1	10	90	3	Fog, 31. Frost, 1, 11, 12.
April	3.4	2.3	3.0	2.9	.16	3	.07	29	3.5	1.5	70	.317	520.5	57	...	3	88	2	Fog, 23. Frost, 3.
May	5.0	5.2	2.3	4.1	.70	9	.35	19	4.1	1.3	76	.367	518.1	42	...	20	89	4	Fog, 30.
June	4.0	3.9	3.2	3.7	.97	6	.30	26	4.6	1.8	72	.414	513.1	42	...	18	85	5	Fog, 6. Thunder, 3.
July	6.6	5.6	4.0	5.4	3.00	16	.97	4	4.9	1.5	77	.443	512.6	38	...	24	82	11	Lightning, 4, 11. Remarkable Rain, 4.
August ...	5.5	5.0	4.4	4.9	1.37	10	.63	3	4.9	1.9	73	.447	510.6	40	13	22	88	5	Thunder, 8 & 22.
September	5.8	5.3	4.2	5.1	2.50	16	.69	28	4.0	1.6	71	.354	517.2	34	16	12	76	17	Hail, 6. Frost, 31. Thunder & Lightning, 6.
October...	6.3	6.1	5.1	5.5	3.73	22	.90	6	3.8	0.6	86	.335	524.4	25	11	26	76	17	Frost, 27. Snow, 13, 19. Hail, 18, 19, 22.
November	6.2	5.7	5.8	5.9	3.27	16	.67	16	2.9	0.5	85	.253	532.2	24	11	24	68	22	Frost, 2, 3, 15, 20, 31. Hail, 8, 9. Lightning, 8, 11. Gale, 7, 11.
December	5.6	5.9	5.2	5.5	5.06	19	.95	12	2.8	0.5	84	.244	533.3	32	7	23	77	16	
Means ...	5.5	5.0	4.5	5.0	2.42	141	.58		3.7	1.1	71.2	.329	522.7	36.2		19.1	78.8	12.8	

AMALGAMATION OF SOCIETIES IN NEW ZEALAND.

By JOHN D. ENYS, Esq., F.G.S., *President, R.I.C.*

In the year 1868 the following four societies were incorporated under an act passed by the parliament of New Zealand, dated 1867 :—The Wellington Philosophical Society, the Auckland Institute, the Philosophical Institute of Canterbury, and the Westland Naturalists' and Acclimatization Society.

The Otago Institute joined in 1869; the Westland Institute in 1874, in place of the previous society; the Hawkes Bay Philosophical Institute in 1875; the Southland Institute in 1880; and the Nelson Philosophical Society in 1883, since broken up.

The members on the roll of the New Zealand Institution numbered 944 in 1889-90.

It was early seen that if each of these Societies published separate transactions, their value would be slight, whereas if they could combine and have one set of transactions for New Zealand, the volumes thus published might be of great permanent value.

An act was brought in and passed by the parliament of New Zealand to enable this to be done in a legal form, dated 1867.

In this act it is provided that no society can join unless it has more than 25 members and a subscription list of over £50, of which sum $\frac{1}{3}$ must be devoted to the maintenance of a museum or library, failing this $\frac{1}{6}$ must be paid to the New Zealand Institution.

The New Zealand Institution has its head quarters at the seat of government situated at Wellington.

Each affiliated society elects members yearly to represent them at the board of the New Zealand Institution, before whom all papers are placed to determine which shall be published in full or in abstract. Should any society fail to fulfil these conditions, they cease to be incorporated. All papers not published are returned to their respective societies.

Subject to the Act of 1867, each society retains its own laws.

The inaugural address of the New Zealand Institute was given by the governor, Sir George F. Bowen, August 4th, 1868.

The first volume of the Transactions of the New Zealand Institute was published in May, 1869, and has been brought down to date, forming a valuable record of the geology, physical features, fauna and flora of New Zealand. Other papers on the customs and language of the Maori native, besides papers of a wider scope, increase the interest of these transactions, which now number XXXIII vols.

To make up a good volume for the first issue, a number of essays on the botany of Nelson, Marlborough, Otago and the North Island, on the ornithology of New Zealand, on the economic botany of North Island, and on the geology of the same, were added.

These essays were published and distributed after the exhibition held at Dunedin in 1865.

Two of them are by Cornishmen, W. Colenso and Sir W. L. Buller, K.C.M.G.

The volumes run up to between 500 and 600 pages, and are well illustrated.

New Zealand can look back to 1851 for its first attempt to found a scientific society, for in that year the New Zealand Society was founded under Sir George Grey.

The following subjects have been suggested as some of those which should be taken up by the members of the societies.

1. History, Mythology, Ethnology, &c., of the Maori race.
2. Fisheries—best localities, and seasons for fishing.
3. Extraordinary Meteorological Phenomena.
4. Hot springs, Landslips, Wearing away of Coast Lines and River Banks, &c.
5. Formation and progress of Sand Dunes.
6. Formation of Sandbanks in Rivers, and Bars to Harbours
7. Occurrence of Rare Plants, Animals and Minerals.
8. Habits of Animals, especially of those destructive to trees and cultivated plants.
9. Mineral and Metalliferous Deposits.

10. Localities for fossils.
11. Naturalization and Diffusion of introduced Plants and Animals.
12. Resources of the Colony in Materials used in the manufacture of Glass and Pottery.
13. Resources of the Colony in Cements, Concretes, Plaster, Building Stone, &c.
14. Substances found available for Dyeing or Tanning.
15. Machines, &c., for the Extraction and Treatment of Ores, and preparing New Zealand Flax.
16. Duration of Native Timber under various circumstances.
17. Plans and Descriptions of Mines.
18. Cause of Failure of introduced Grasses on some of our soils.
19. Effect as Manure of various substances found in the Colony.
20. Plants suitable for Live Fences in this country.
21. Medicinal Plants.
22. Trees available for Timber.
23. Arboriculture.
24. Proposed Lines of Railway.
25. Harbour Improvements.
26. Experiments in Improving Breeding of Stock.
27. Experiments in this Colony on the Culture of the Vine, Hop, Sugarbeet, Rice, Barley, European Flax, New Zealand Flax, &c.
28. Adulteration of Food.
29. Sanitary Condition of our Cities and means of improving them.
30. Effects of our Climate on Diseases.
31. Machines and Processes for the Washing of Sheep, and on Boiling-down Establishments.

MULLION ISLAND.

By HOWARD FOX, Esq., F.G.S., *President of the R.G.S. of Cornwall.*

In the fourth volume of the Transactions of the Royal Geological Society of Cornwall published 60 years ago, Dr. H. S. Boase gives the result of two years unceasing labour in exploring the geology of our county, and at page 344 we read the words "I did not go on Mullion Island, but, from the nearest headland, it appears to be composed partly of serpentine and partly of hornblende rocks." In the map, which accompanies his paper, he wisely leaves the island uncoloured. I can find no other reference to Mullion Island in any of the eleven volumes of this Society's Transactions.

The map of Cornwall published by the Geological Survey does, however, colour this island, and colours it as if it were of serpentine. There is, nevertheless, not a fragment of serpentine or hornblende schist apparent in the island.

In August of last year, accompanied by my friend Mr. R. N. Rogers, I was able to carry out a long planned trip to the island. Finding rocks there with which I was unfamiliar, I sent some specimens to be sliced for the microscope, and forwarded them to Mr. J. J. H. Teall, F.R.S., who kindly examined them and reported that two were from sedimentary rocks, one of which appeared to be a radiolarian chert and the other a limestone. Further specimens from the island were sliced, and the fact was verified that Mullion Island contained Radiolarian Cherts!

Mr. Teall came to Cornwall the following November, accompanied me to Mullion and found the main mass of the island to be composed of a fine-grained "greenstone" of a peculiar globular or ellipsoidal structure associated in certain parts of the island with bands, sheets, and lenticles of chert, shale, and limestone, as indicated in the map annexed. He moreover discovered that the reticulated structure of the individual radiolaria could be clearly seen by placing the weathered surface of some specimens under the microscope, whilst even to the naked eye they were apparent as minute specks thickly dotting the light coloured edges of the dark chert bands. An ordinary pocket lens shows each of these specks to have a circular form.

A joint paper by Mr. Teall and myself, fully describing the manner in which these cherts occur and their supposed relation to the greenstone, was read to the Geological Society in London on the 8th February last, and was published in the Quarterly Journal.

Dr. Hinde, one of the first living authorities on this subject, appended, to the paper, notes on the species disclosed by the microscope, with drawings of their various forms; enlarged copies of which you see on these walls.

Let us clearly understand what the term Radiolarian Chert implies. Messrs. Page and Lapworth* describe flint as the name used for impure nodules of silex, abundantly found in chalk strata, while chert is the name given to the impure silicious nodules and layers found in many other rocks.

The animal kingdom is divided by these authorities into 9 sub-kingdoms. The Vertebrate, with man at their head, are at the top of the scale, whilst the Protozoa (from protos, first; zoe, life) form the 9th sub-kingdom, and occupy the lowest position. The Protozoa are the most simply organised members of the animal kingdom, the most lowly of our fellow-creatures, without nerves and in most species without stomachs. Amongst the Protozoa is the order Radiolaria, including marine organisms which, though little more than sacs of jelly-like protoplasm, have the power of secreting beautiful reticulated tests or skeletons of pure silica. As regards their distribution in space they are exclusively marine, and are found in all seas and at all depths. The most famous of the Radiolarian clays and marls is the Polycystine marl of Barbadoes, described by Messrs. Harrison and Jukes Brown, the age of which is miocene. According to Prof Haeckel, the number of species of Radiolaria, in this "Barbadoes Earth," is not less than 400, and is probably more than 500. He states that very many of the Barbadoes Radiolaria are to-day extant and unchanged in the Radiolarian ooze† of the deep Pacific ocean. Specimens of these Polycystina are exhibited in the microscopes on the table, and micro-photographs will be shown by lime-light this evening.

* Introductory Text Book of Geology, 1888, p. 72.

† Nicholson and Lydekker Manual of Palæontology, 1889, vol. I, p. 149.

In Messrs. Murray and Renard's Report on the Scientific Results of the Voyage of H.M.S. Challenger* we find the following entry during their voyage from the Admiralty Islands to Japan.

"Siliceous shells and skeletons were especially abundant in some of the deposits in this section, more numerous than in any deposits previously met with during the cruise. In one instance these beautiful little organisms made up about $\frac{4}{5}$ ths of the deposit, which was in consequence called Radiolarian Ooze. This was the case in the deepest sounding, viz: 4,475 fathoms (over 5 miles), the greatest depth from which a specimen of the bottom had hitherto been obtained."

A map is annexed by these gentlemen, giving approximately the nature of the ocean floor over the whole globe. They estimate that 2,290,000 square miles of the ocean floor is covered by Radiolarian ooze at a mean depth of 2,894 fathoms. They find that this ooze contains only 4.01 per cent. of calcic carbonate, and they consider that Diatoms and Radiolaria play a much more important part in separating the soluble silica from the sea water than do the siliceous sponges. This Radiolarian ooze of the deep Pacific will consolidate in the course of ages into the Radiolarian chert of the present era.

The specimen of rock from the Mullion Island in your Museum shows the Radiolarian chert traversed by a network of white quartz veins with alternate layers or bands of chert and shale. Thirty distinct bands of chert may occur in a thickness of 3 feet of rock. These bands show signs of having been compressed when plastic, and have also been faulted since they solidified. Radiolarian ooze can only be deposited in seas where there is little or no mud. Each band of chert is mainly composed of the exquisitely reticulated skeletons or tests of Radiolaria. A vast period of time may have elapsed during the deposition of radiolarian skeletons sufficient to form a single band of this chert. The alternation of chert and shale bands may be accounted for by the supposition that a submarine volcano introduced so much mud into the ocean as to prevent the silex of the Radiolarian skeletons from binding, and thus for a period

* Deep Sea Deposits, 1891, p. 175.

mud was deposited which ultimately consolidated into shale. Then after a time the ocean becomes again free of mud and the Radiolarian ooze is formed, to be followed by another period of mud deposits and so on.

But if the Radiolarian chert of Mullion Island was once Radiolarian ooze deposited on the floor of an ocean hundreds of miles from shore, it follows that at least the whole West of England must have been at one time the floor of an ocean covered with Radiolarian ooze, and that wherever rocks of that period are exposed there one should find this chert. The mainland of Cornwall should, therefore, have this chert exposed as well as the Island of Mullion. This is now proved to be the case. Messrs. Teall and Lapworth visited us last Easter, and I was privileged to accompany them. We succeeded in discovering these cherts extending for over 800 yards in the cliffs and in the foreshore north of Porthalla. Other extensive exposures have since been traced in Vryan, Caerhays, Gorran, and other parishes, a description of which will appear elsewhere.

Until Dr. Hinde,* three years ago, described the Radiolaria of the Llandeilo Caradoc Rocks of South Scotland, only a single species of Radiolaria had been noticed from the entire Palæozoic series, and this was discovered in Saxony. He tells us that "this Scotch chert is the first instance in which, in our area, this description of rock has been traced to the skeletons of other organisms than sponges."

Thus Mullion Island has the honour of being the second locality in the United Kingdom where Radiolarian chert has been discovered in early palæozoic rocks, and so far is the only locality in Cornwall where Radiolarian chert is found, *in situ*, to contain Radiolaria in sufficient state of preservation to enable experts to determine their respective species.

You may ask at what precise period of the earth's history did these radiolaria live, to what geological system do these cherts belong? That can only be answered by finding some typical fossils in the shales associated with them. Dr. Hicks expects they will prove to belong to the base of the Ordovician system. Only one fossil has been as yet found in the Mullion

* Annals and Mag. of Natural History, July, 1890, pp. 40—59.

Island shales. It is barely visible to the naked eye. You may see it under the microscope on the table. Experts cannot determine its character. They think it may be a "Conodont," that is to say the jaws of an Annelid. Conodonts occur in rocks as ancient as the Upper Cambrian.

It is in your power, ladies and gentlemen, to settle this matter. When you next visit Mullion Island, take your hammers and search the shales which accompany the cherts. A lucky blow may disclose a fossil that will once for all determine the age of these rocks, and as similar radiolarian cherts have been traced for 25 miles E.N.E. of Mullion Island on the mainland, it may settle once for all the age of our rocks further east, and furnish a "datum line or horizon of reference" which will give a clue to the true geology of our county.

THE NEW CALIFORNIAN STAMPS AT DOLCOATH MINE.

By JOSIAH THOMAS, Esq., J.P.

The "Cornish Stamps," which is almost universally used throughout the County for stamping tin stuff, is known as a "gravitation stamps," the work done depending mainly on the weight of the heads and the height they are lifted. Some improvements have been made in this type of stamps during my remembrance. Iron lifters have generally been substituted for wooden ones, and the heads have been made heavier than formerly, but the same cumbersome cast iron axles and the same form of heads are still used. The great drawbacks to this kind of stamps are the enormous dead weight of the axles and cams (amounting in a large stamps to 30 or 40 tons), and the square heads which, being fed from behind, wear away in the back part faster than in the front, and thus become much less effective.

The New Californian Stamps, recently erected at Dolcoath Mine, is also a gravitation stamps, but is constructed on a different principle. The heads and lifters are round, and are made to revolve—the lifters 3 inches in diameter working in teak wood guides. The heads are fitted in the bottom with cast iron shoes, of about $1\frac{1}{2}$ -cwt. each, which take all the wear, so that there is practically no wear in the heads themselves. There are at present 40 heads at work, but the steam engine is of sufficient power to drive an additional 40 heads. There are 8 iron coffers with 5 heads in each, arranged in 4 batteries of 10 heads each, driven off the main shaft by a separate leather belt to each battery. Cams lifting the heads twice to a round are fixed on a cam shaft 5 inches in diameter. There is a separate finger or "jack up" provided for each lifter, so that each coffer can be quickly stopped for repairs or renewals when required without interfering with the working of the remaining stamps. The falling weight of each head is 800-lbs., set to drop 9 inches, and run at a speed of 80 drops per minute. The mesh of grate used is No. 37, having 132 holes to a square inch.

The engine is of the modern girder type, compound horizontal and jet condensing, coupled at right angles with heavy fly wheel between. The cylinders are $15\frac{1}{2}$ and 27 inches respectively, and 4 feet stroke, fitted with metallic pistons and expansion valves on back of main slides, adjustable by hand whilst the engine is running. Each cylinder is fitted with steam auxiliary at either end, so that the engine can be easily started in any position with full load on. The engine is controlled by a Tangye's high speed governor to run at a speed of 48 revolutions per minute, being equal to a piston speed of 384 feet per minute. Steam is raised by two Cornish boilers, each 6 feet diameter and 30 feet long, with tubes 3 feet 6-in. diameter strengthened by Bowling expansion rings, the ends being each in one plate flanged and gusseted, and the shell double rivetted longitudinally—all made with Siemen Martin mild steel, constructed for a working pressure of 100-lbs. per square inch and tested to 200-lbs. All the mountings and pipes are extra strong to match. The boilers are fed by a steam donkey engine with cold water supplied by the Camborne Water Company. The same boilers supply steam to Messrs. Holman Brothers' engine, which pumps water from the adit for condensing and tin dressing, and also to a small Tangye's engine for electric lighting.

The chief advantages of this New Stamps over the Cornish may be summed up in a few brief sentences.

The steam is worked at 100-lbs. pressure instead of about 40-lbs., so that the engine works much more economically.

The cam shafts with cams for lifting the heads not being more than about one-fifth the weight of the huge iron axles and cams in the Cornish stamps for a similar output, a much less power is required to turn the axles.

The heads being circular and revolving at every lift, they wear much more evenly and consequently do much more effective work.

The wear and tear of the heads and lifters and of most of the other working parts of the stamps is much less than in the old stamps. The friction is also considerably lessened.

Much less time is occupied in changing the heads and in stopping for repairs.

The consumption of fuel as compared with power shown by indicator diagrams is 2·38-lbs. of coal per indicated horse power per hour—being equal to a duty of 70 millions of pounds lifted one foot high by the consumption of 112-lbs. of coal. The output of tin stuff of ordinary size and hardness is about 2 tons per head in 24 hours when the stamps are kept fully at work—the consumption of coals being about 2 tons for the 40 heads. This is about twice as much stuff per head as is stamped by the average Cornish stamps with about the same quantity of coals.

The whole of the plant was supplied by Messrs. Harvey & Co., of Hayle. It was ordered on June 13th, 1892, and together with the dressing floors was completed and set to work on November 28th, 1892.

THE CLIMATE OF WEST CORNWALL.

By E. KITTO, Esq., F.R. Met. S.

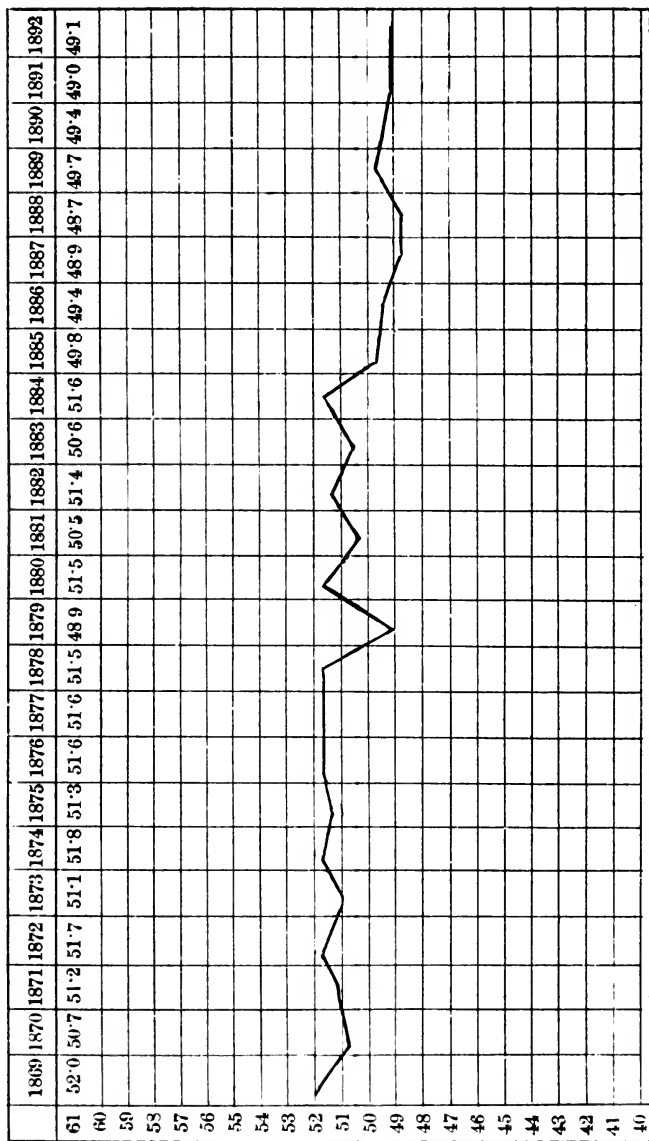
When the Joint Committee of the several County Societies represented here to-day invited me to prepare a paper for this meeting, and suggested the subject of Climate of West Cornwall, I readily fell in with the suggestion. There exists a large mass of data bearing on the meteorology of Cornwall, extending over the last half century or more, for which we are indebted to several observers, including such earnest and diligent meteorologists as the late Dr. Barham of Truro, M. P. Moyle of Helston, and Commander Liddell of Bodmin, the result of whose observations have to large extent been published in the Journals of the Royal Institution of Cornwall and of the Royal Cornwall Polytechnic Society. To the mind of the general public, however, who have little taste for elaborate statistical information, and to the busy man who wishes to have the sum of the matter put before him in as concise form as possible, the labour of consulting a mass of tabulated figures, not always easily accessible, and by concentrated effort to draw general conclusions therefrom, is a task devoid of charm if not absolutely distasteful.

Cornwall undoubtedly possesses a fine climate, and it is alike desirable that Cornishmen should be fully cognisant of the climatic advantages they enjoy, and that our fellow countrymen beyond the borders of the County should be made acquainted with the fact that they need not rush to the Riviera to escape the rigour of a north or east England winter, but that on the contrary they may not only find in West Cornwall all the more favourable climatic advantages of the sunny south, but may also avoid some of the disadvantages which that district presents, and the lengthy journey to reach it.

It is impossible to treat of this subject without having recourse to statistics, but for present purposes they shall be as few as possible, and of such a character as will, I hope, with the help of diagrams, which perhaps convey to the mind better and more correct ideas than do figures, present to you in intelligible form the climatic conditions of West Cornwall.

DIAGRAM I.

MEAN ANNUAL TEMPERATURE, 24 YEARS, 1869—1892.

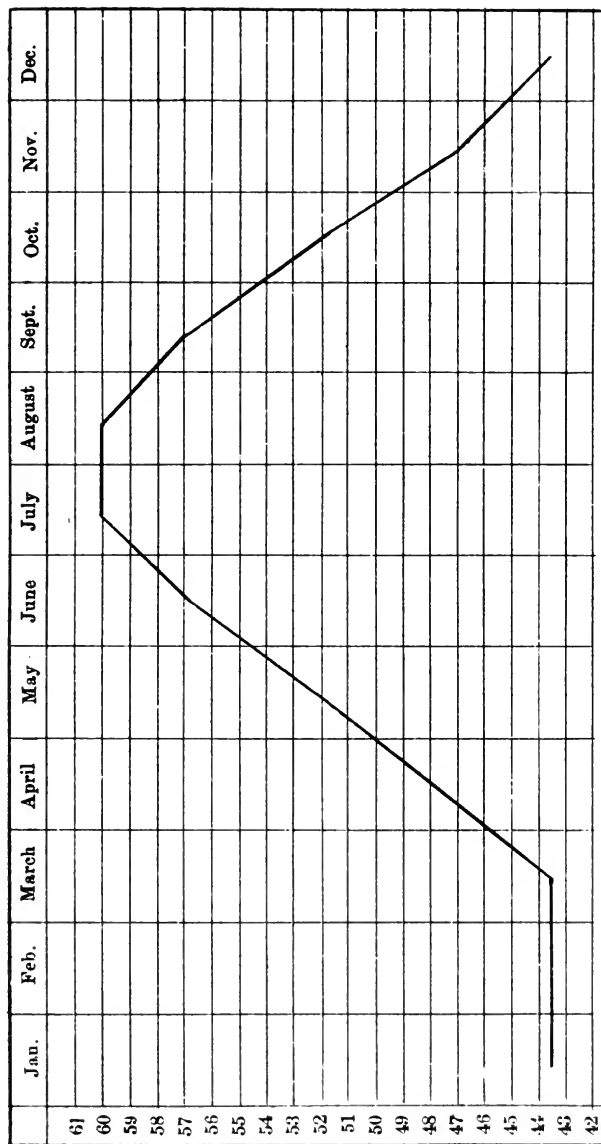


Mean 50.5

50.5 Mean

DIAGRAM II.

MEAN MONTHLY TEMPERATURE FOR 24 YEARS, 1869-1892



My purpose will be best served by taking the subject under three heads, viz., temperature, rainfall, and sunshine.

Temperature. A climatic condition which is generally agreeable to the healthy, and which becomes a real necessity to the weak is equability of temperature. What is desired is that there shall be no violent transition from heat to cold, or *vice versa*, from month to month and from day to day, but that such changes as Nature imposes in this respect shall be so graduated as to cause no serious inconvenience from a sanitary or hygienic point of view. More particularly is it desired that the diurnal range or differences in day and night temperature shall not be extreme.

These conditions are characteristic of the climate of Cornwall in a marked degree; this should be made widely known, not only for the more exact information of residents in the County, but also for the benefit of those to whom an equable climate is essential to the maintenance of good health, if not an absolute necessity to existence, particularly during the winter months.

The mean annual temperature of West Cornwall, as deduced from observations made at Truro, Falmouth, and Helston, between the years 1871 and 1887 is 51° , and the daily range of temperature 11° . These observations show that there is not much more than 1° difference in the annual temperature at these respective stations, whilst the daily range differs by 5° , Falmouth showing the least range, $8\frac{1}{2}^{\circ}$, owing to its closer proximity to the sea.

The information conveyed by the diagrams accompanying this paper has been deduced from the observations made at Falmouth only, and for the following reasons. (1) That I have at my command all the records taken at the Falmouth Observatory from its establishment to the present time, extending over 24 years. (2) That those records have been made with perfectly reliable instruments, frequently verified, and well placed, and under similar conditions throughout the whole period, and are therefore highly trustworthy. The results here shown for Falmouth may also be regarded as fairly representative of the climate of other seaside stations as Penzance, Marazion, and

St. Ives. Stations further removed from the sea undoubtedly experience greater differences of heat and cold, but the narrow peninsula of West Cornwall may be said to present no serious differences in the general climate of various localities within its borders.

Our first diagram (I) gives the mean annual temperature for 24 years, indicated by a straight red line, and the mean temperature for each year of that period shown by an irregular black line. It will be seen that the first 16 years of the series were all—save one—above the average, and the last 8 years below the average temperature. The exception in the first group is 1879, when the temperature fell below the average in every month except March.

The next diagram (II) shows the mean monthly temperature, which varies from about $43\frac{1}{2}^{\circ}$ in winter to 60° in summer. It is noticeable how very equal are the four winter months of December, January, February, and March, the difference between them 0.2° only, being so slight as to make them practically identical.

It is worthy of remark that during the whole period of 24 years referred to, the recording thermometer at Falmouth Observatory never indicated as much as 10° of frost, the lowest readings being 22.4 on 29th November, 1890, and again on the 18th January, 1891, whilst the freezing point (32°) was not reached at all during the years 1872, 1873, 1877, and 1884. The highest recorded reading was 80° on 17th July, 1876.

The mean daily range is given (in diagram III), and shows that the values for November and December and those for January and February are equal; the daily range during these four months, 7° or less, is remarkably small.

The relative proportions of wind visiting us from the four quarters are, North 22, East 15, South 27, and West 36 per cent. It will be seen that the prevailing winds are from the west and south, consequently our atmosphere is rather moist, the average degree of humidity being 83 per cent.

The air is driest in May and June, and most humid in January. There is, however, an almost entire absence of fog.

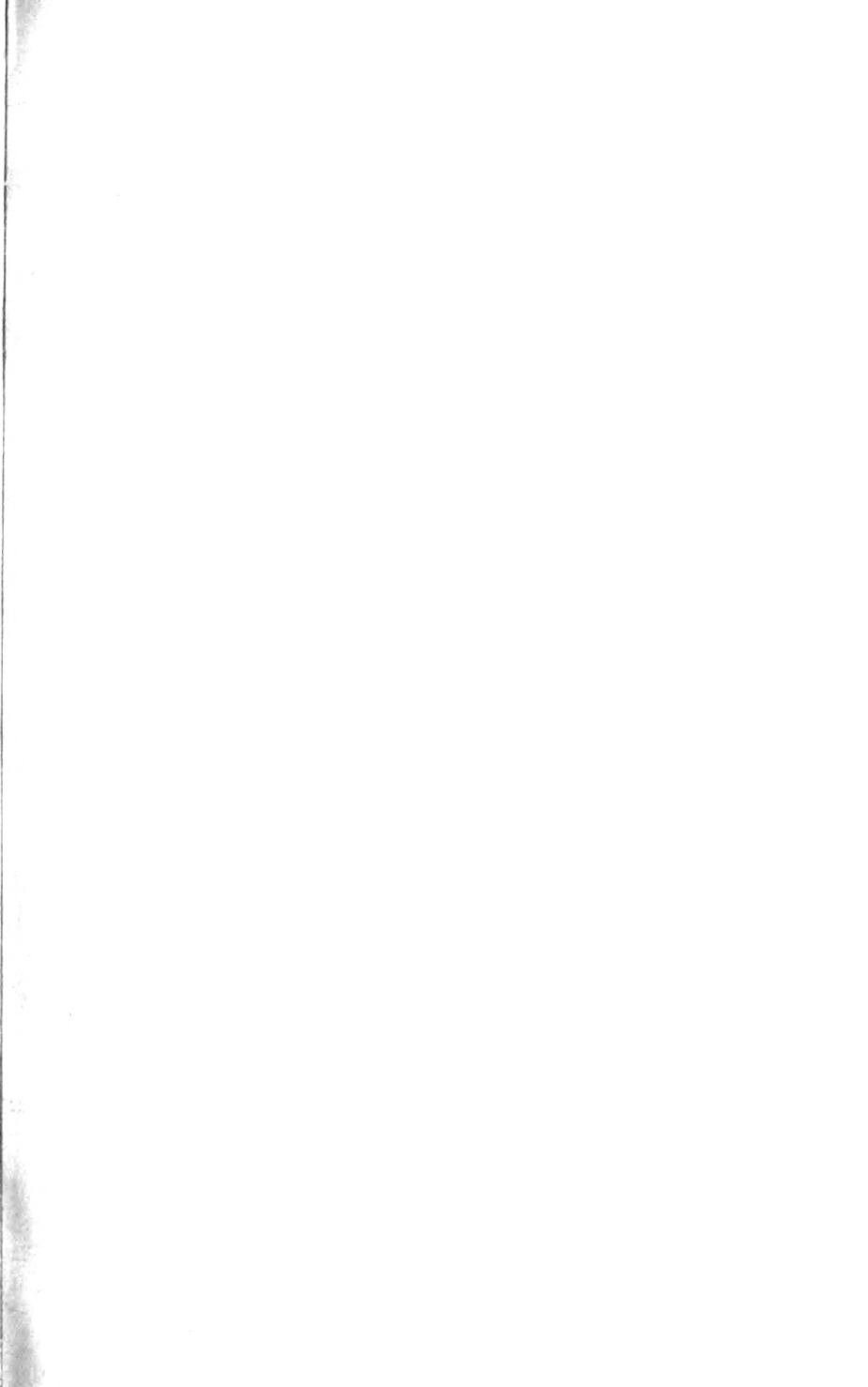


DIAGRAM III.

MEAN DAILY RANGE OF TEMPERATURE FOR [EACH MONTH OF YEAR DURING] 24 YEARS,
1869 TO 1892.

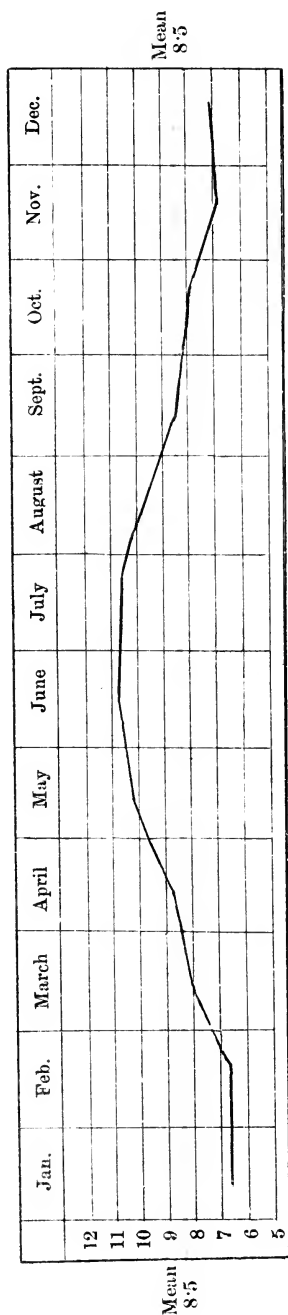
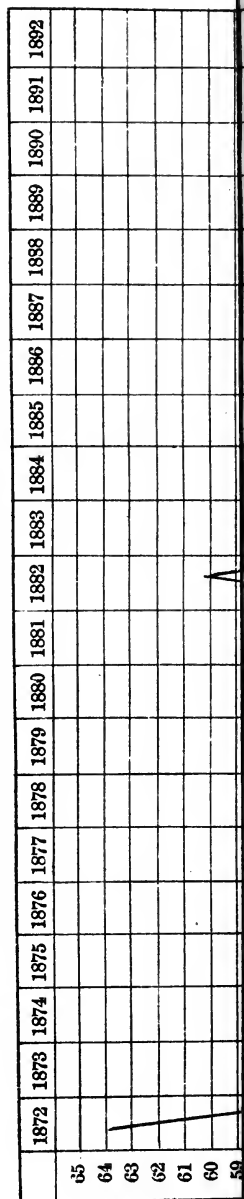
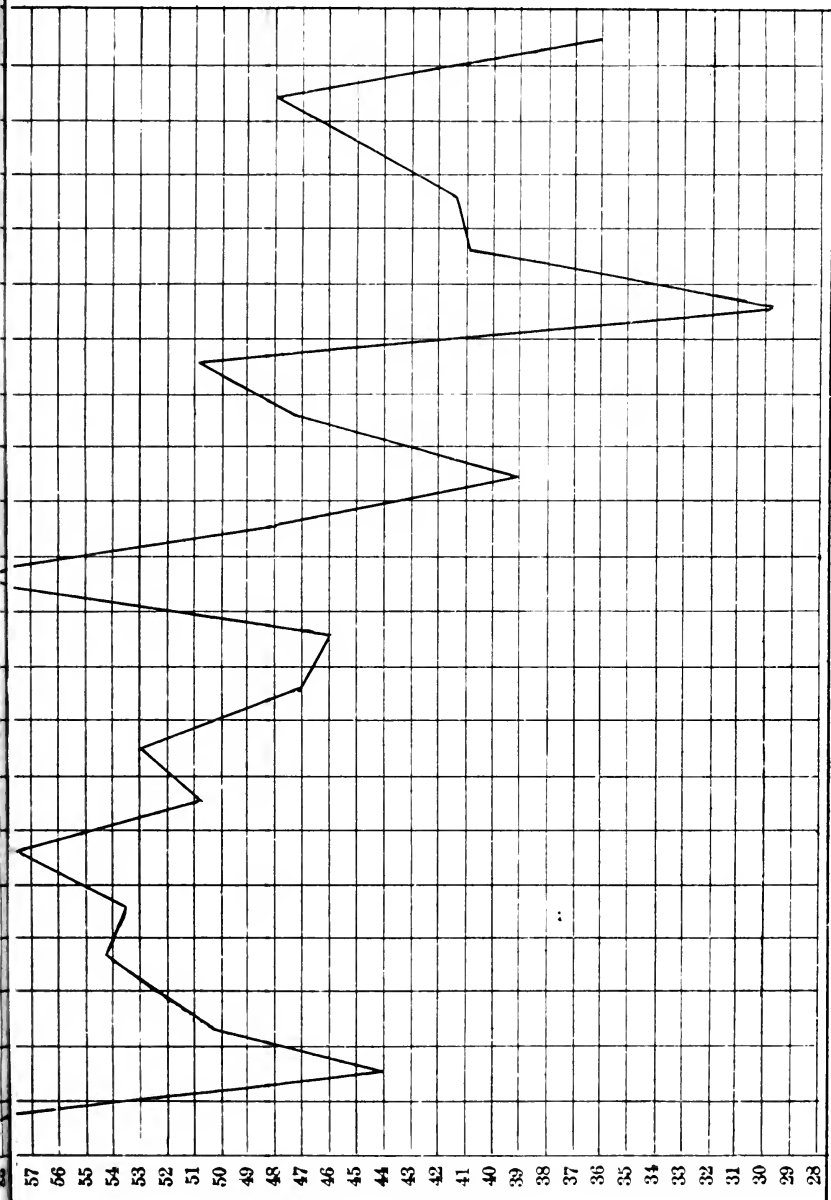


DIAGRAM IV.

ANNUAL RAINFALL FOR 21 YEARS, 1872 TO 1892.



Mean 48 In.



Mean
48 In.

Rainfall. The rainfall of West Cornwall is considerable. The records for the years 1871 to 1887 give for Truro 42 inches, Helston 42 inches, and Falmouth 50 inches, or a mean of $44\frac{1}{2}$ inches. Taking the 21 years, 1872 to 1892, during which period continuous records have been made at Falmouth, we get an annual mean of 48 inches. The accompanying diagram (IV) shows how very varied in amount the rainfall has been, extending from a maximum of 64 inches in 1872, to a maximum of $29\frac{3}{4}$ inches in 1887, the year of Her Majesty's Jubilee, when, it will be remembered the month of June was almost rainless, and every month of the year, except September, gave a record considerably below the average.

Although the rainfall of West Cornwall appears to compare unfavourably with that of the Eastern and South Eastern Counties—London giving a record of about 26 inches as against our 44 inches—yet, generally speaking, little inconvenience is felt by us at the presence of so much rain, as owing to the nature of the Cornish soil and its many hills, the water either quickly percolates through the earth or runs off and leaves our highways and paths dry and pleasant; the sun soon shines out again after rain, and the atmosphere cleansed by the rain and brightened by sunshine becomes remarkably pure and transparent and full of health-giving properties.

If we take into calculation the returns for Newquay, Penzance, and St. Austell, from values published by Mr. G. J. Symons, F.R.S., in his "British Rainfall," and for Phillack on the authority of the Rev. Canon Hockin, we get with the stations already mentioned, a mean annual rainfall for West Cornwall of $43\frac{1}{2}$ inches, which is 12 inches less than that for East Cornwall.

Bright Sunshine. (Diagram V.) The amount of sunshine which a district enjoys is a matter of great importance, as it has considerable effect upon the health and general tone of the inhabitants.

In respect to sunshine, Cornwall is highly favoured, as shown by a very interesting record of Ten Years' Bright Sunshine for 46 Stations in the British Isles, 1881 to 1890.* The instrument used at all these stations, save two, is the

* Published by the Authority of the Meteorological Council, London.

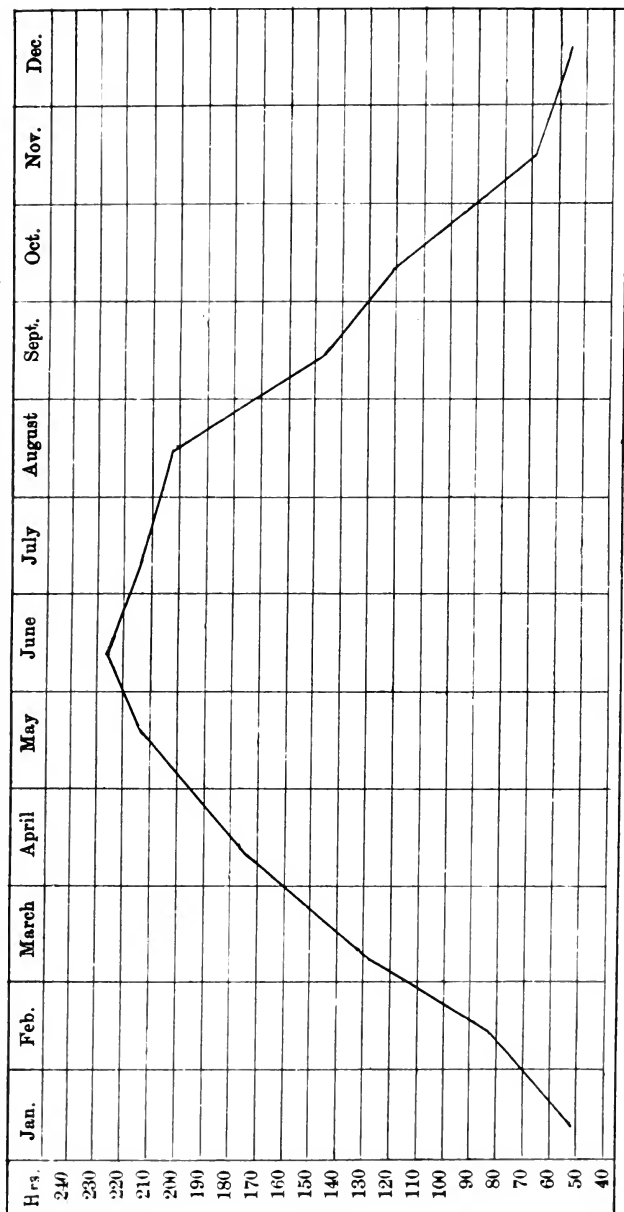
Campbell Stokes pattern which registers sunheat, as distinguished from the Jordan McLeod instruments which register sunlight, and an amount considerably in excess of the Campbell Stokes instrument. In the Campbell Stokes recorder the sun's rays falling on a sphere of polished glass are focussed on to an adjusted card and burn a trace along it. The slightest film of cloud or a little haze in the atmosphere is enough to check the burning action. Further it must be remembered that the sun will not burn readily at very low altitudes, and that consequently no record is obtained for at least 15 minutes after sunrise and before sunset; the record made is therefore said to be one of *bright* sunshine. From the official publication referred to it is shown that Cornwall—represented by Falmouth where sunshine records have been made during the 10 years dealt with—is one of the sunniest districts in the United Kingdom. If we omit Jersey, which takes a decided lead, Falmouth then takes first place of the 45 mainland stations enumerated in point of sunniness, giving the highest record of sunshine for 9 months of the year, viz.: February and March, and June to December.

In July, August, October, November, and December, Falmouth stands unrivalled; in February, March, June, and September first position is shared with one or two other stations, chiefly S. Ann's Head. Falmouth takes third place in May, fourth in April, and seventh in January. Taking the year as a whole, Falmouth gives the highest percentage of bright sunshine of any mainland station in the kingdom, viz.: 35·7 p.c. of possible duration, and is followed by S. Ann's Head on the West coast and by Geldeston on the East coast, each with 1 per cent. less.

In Cornwall the sunniest month is June, the least sunny is January. The year of greatest sunshine of the series in Cornwall was 1887, with 2074 hours, and its June—Her Majesty's Jubilee month—was the sunniest month on record, giving 329 hours or nearly eleven hours daily, the highest record for that period in the United Kingdom.

On an average of the past 12 years the sun shines brightly on us for a greater or less time on 300 days in the year, or 25 days each month; the duration giving a summer mean—April to September—of $6\frac{1}{2}$ hours daily, and a winter mean for the remaining 6 months of $2\frac{3}{4}$ hours daily.

MEAN MONTHLY AMOUNT OF SUNSHINE IN HOURS, FOR 12 YEARS, 1881 TO 1892.



Conclusion. The climate of West Cornwall may be summed up generally as equable, moist, balmy and bright, rivalling that of the South of France in geniality and equability, as evidenced by the wealth of exotic flora with which many of the private gardens in the County abound, and to which public attention has from time to time been called through various channels.

In the Annual Report of the Royal Cornwall Polytechnic Society for 1881 may be found an interesting article by Mr. Ernest Bullmore, entitled "Floral Notes of the winter of 1880-81," in which he enumerates about 150 specimens of exotics which he saw *flowering* in the open on 4th January, 1881, in the neighbourhood of Falmouth. He also gives a list of a score of plants killed or injured at Kew, and uninjured at Falmouth during the winter, a period of exceptional cold. Mr. Howard Fox also gives a list of 100 wild flowers, flowering in the same neighbourhood, many of them profusely in December, 1880, and January, 1881.

In the same volume, Mr. Wilson L. Fox publishes highly valuable Tables of Comparative temperatures at various British Stations for the period of extreme cold in January, 1881, in which he shows that the thermometer fell below freezing point on fewer occasions in the Cornish centres than anywhere else in the kingdom. Subsequent reports of the Polytechnic Society contain several tables compiled by Mr. W. L. Fox, showing the winter temperatures of West Cornwall stations compared with those of several popular British and Continental Winter Health Resorts, by which it may be seen that Cornwall holds a very favourable comparative position.

Well might the editor of "Sunny Corners of Homeland" say, writing of Cornwall in February last—"Falmouth, 8½ hours from London, has a mean winter temperature only one degree less than Montpellier and Florence; at St. Ives the mean is only four degrees less than Rome, while frosts are rare, and snow almost unknown. Penzance, too, is favoured with a climate equal to that of Falmouth, while its near neighbour, Marazion, is completely sheltered from east winds, and is said to possess the mildest climate in England. Of the Scilly Islands little more need be said, than that the isothermal line of Gibraltar passes through them, and that the mean winter temperature is 46·7 degrees.

As may be expected, among the trees, plants and flowers of the extreme south-west, are many which are sub-tropical, such as aloes, azalias, acacias, agaves, bamboos, eucalypti, yuccas, veronicas, orange, and citron trees, &c., while at Scilly the date palm and Norfolk Island pine not only grow, but flourish in the open air.

To this silent testimony, which, however, *speaks volumes* as to the mildness of the climate, we may add, by way of conclusion, that Cornwall is not troubled by visitations of the icy *bise* or the piercing *mistral*, but enjoys a climate in every way conducive to health."

ON THE ORIGIN AND DEVELOPMENT OF ORE DEPOSITS IN THE WEST OF ENGLAND.

By J. H. COLLINS, F.G.S.

CHAP. III.—ROCK CHANGE AS CONCERNED IN THE FORMATION OF ORE DEPOSITS.

Sec. 13,—*On the localization of Mineral Substances in the West of England Mining District.**

GROUP 3. *Iron, Manganese, Nickel, Cobalt, &c.*

Iron in its various combinations is so abundant, not only in the veins, but also in most of the rocks of the district, that it might at first seem useless to consider its localization in connexion with our present enquiry. Yet there are several prominent facts which so markedly illustrate this localization as to claim our attention. Everyone may see, for instance, that the kaolin districts as a whole contain very little iron diffused through the rock-masses; in fact, china-clay and china-stone would be worthless if they contained any considerable proportions of this element. Yet, some of the purest veins of red-hematite ever found, occur in china-clay rock, as at the Ruby Mine near St. Austell, and near Hawkstor on Bodmin Moor. Moreover, there are few masses of kaolinized granite known which are not somewhat closely associated with the highly ferruginous minerals, schorl, and lepidomelane.

The veins above referred to as existing in altered granitic rocks are mostly cross-courses, running more or less in meridional directions. Many ferruginous cross-courses are also known in killas districts, as for instance, those formerly worked at Restormel, Pawton, and other places. There are, too, several important east and west veins known which contain, at least in their upper portions, large quantities of iron, the most notable being the great Perran lode already referred to. In fact, the veins of Cornwall could furnish considerable quantities of excellent iron-ore were the price somewhat higher than it has been now for some years past. Iron is, in fact, almost always abundant in

* Continued from the *Journal* No. 39, p. 377.

the veins, not only as oxides (and even, though far less frequently, as carbonate), but also as sulphide and sulpharsenide, in ferruginous blende, in chalcopyrite, in tourmaline, and in chlorite. The important occurrence of iron-oxide as gozzan has already been referred to.

Manganese as a rock-constituent is rarely altogether absent, though the proportion is generally very small.

The manganese of the West of England mostly occurs as peroxide, which is often associated with a great deal of iron and silica. It also occurs as a carbonate and as a silicate, but its affinity for sulphur or arsenic appears to be very slight.

The peroxide is most abundant in the Devonian slates to the north of Tavistock, where it occurs in the form of interbedded lenticular deposits. Similar deposits have also been worked at Newton St. Cyres, on the east of Dartmoor. Considerable quantities of peroxide have also been met with in a vein at the Ruther's mine, on Tregoss Moor. None of these deposits can be looked upon as exhausted, but they cannot be worked at a profit at present prices.

Nickel and Cobalt generally occur together, either in tin or copper veins, associated with much ferruginous matter; or else in cross-courses near their intersections of such veins. They are rarely found except in combination with arsenic. The most important deposits have been met with at East Pool, Dolcoath, and other mines of the Camborne and Illogan district, and at St. Austell Consols, but very small quantities have been found in many other localities.

The earliest notice of the occurrence of these metals which I have yet come across is that of Dr. Borlase, who says that nickel was found at Pengreep in Gwennap, in 1754. It was discovered in a branch of a lode while driving an adit, but did not hold in depth. Mr. Beauchamp got the Society of Arts prize of £30 for the best nickel-ore raised in England.*

Pryce, writing 20 years later, said that Cobalt had been found at Trugo in St. Columb, in a vein from 4 to 6 inches thick, where it crossed a copper lode, but only continued for a short distance. It was then considered to be worth £60 per ton.

* *Borlase, Nat. Hist. Corn.*, p. 130.

Cobalt had also been found at Dudmans mine in Illogan ; in a mine near Ponsanooth, and in Dolcoath.* In 1818, Kupfer-nickel was raised at Pengelly mine in St. Ewe, according to Mr. Gregor, but nothing is said as to the quantity.

Sir Henry de la Beche, writing in 1837, says that Cobalt had been found in a cross-course adjoining a copper-lode at Wheal Sparnon near Redruth, and again at Dolcoath ; also at Botallack, Herland, Polgooth, and Wheal Unity. At this latter mine 1,700 lbs. of an inferior quality was sold in 1820. Cobalt had also been found at Wheal Huckworthy near Sampford Spiney. The ores were mostly tin-white cobalt (Smaltite) and Cobalt bloom (Erythrite)†

In the period from 1854 to 1861 the largest producer of nickel and cobalt was St. Austell Consols,‡ as may be seen by the following figures which are taken from Mr. Williams's statement, and supplemented by the *Mineral Statistics* for the period.

				Value.		
				£	s.	d.
				Tons.	cwt.	qrs. lbs.
1854	St. Aust. Consols, Ni. & Co...	75	0 0 0	6527	0	0
1855	„ „ „	39	0 0 0			
1856	„ Ni. „	11	12 2 17	517	10	1
1858	„ „ „	1	9 0 14	72	12	9
1859	„ „ „	2	14 0 4	121	11	7
1860	„ „ „	3	5 1 14	134	8	1
1861	„ „ „	0	15 2 22	23	10	10
Total for 7 years . . .				133	16	3 15
				7396	13	4

Small quantities of these ores have since then been raised from other mines, as is shown by the following returns from the same official source :—

		Tons cwt.			qrs. lbs.			£	s.	d.
1858	Fowey Consols (Ni. & Co.)	..	3	0	0	0	0	110	5	0
1860	„ „	..	3	8	2	0	0	119	17	6
1867	„ „	..	1	17	1	0	0	14	12	5
								8	5	3
								244	14	11

* Pryce, *Min. Corn.*, p. 50.

† Report, &c., pp. 614-5.

‡ For a description of the mode of occurrence of the nickel and cobalt-ores, see a paper by the manager, Mr. R. H. Williams, *Rep. Roy. Inst. Corn.*, 1857.

1871	East Pool	.. (mainly Co)	3	0	0	0	120	0	0
1872	,,	.. ..	1	0	0	0	20	0	0
1873	,,	.. ..	0	6	0	0	12	0	0
			<hr/>				<hr/>	<hr/>	<hr/>
			4	6	0	0	152	0	0

Of late years the non-cobaltiferous nickel-ores of New Caledonia have brought down the price of nickel, and still later, the enormous quantities of nickel-matte obtained from the Sudbury ores.

Uranium, like nickel and cobalt, has been usually found hitherto in veins yielding ores of tin or copper, or in cross-courses near the intersections of such veins. It occurs usually as the proto-peroxide known as pitchblende, in which form considerable quantities were formerly raised from St. Ives Consols, and smaller quantities from the St. Just, Camborne, and Illogan Mines. The beautiful phosphate, known as copper-uranite or Torbernite, has also been found in the form of groups of fragile crystals in the shallow parts of almost every copper mine in the county. In one instance a definite N.S. vein of uranium phosphates has been met with and worked for a considerable distance.*

The following statistics of uranium production in the west are certainly imperfect, yet they will afford some idea of the rarity of the compounds of this metal from a miner's point of view :—

St. Austell Consols (1856—1863) East Pool (1877—1879) Wheal Owles (1878-9) South Terras (1873-89) 1890 1891-93)	}	Quantity.					Value.		
		Tons	cwts.	qrs.	lbs.		£	s.	d.
		0	18	0	19	..	65	0	0
		0	9	3	18	..	68	0	8
		0	5	2	0	..	50	0	0
		10	0	0	0	(est.)	640	0	0
	..	22	0	0	0	,,	2200	0	0
	..	93	0	0	0	,,	1860	0	0

* At South Terras, near Grampound Road.

Chromium and *titanium* have scarcely occurred except as oxides, and in combination with iron, forming the minerals *chromite* and *Ilmenite*. Of *Ilmenite*, rather considerable quantities occur in several parts of the Lizard district, as at Manaccan and Porthalla. It occurs, too, disseminated mostly in small proportions, through the basic intrusive rocks, not only in the Lizard country, but everywhere throughout the district. It is also present, to a small extent, in many of the slates near the veins. As the very rare minerals anatase, Brookite, and rutile it has been found at Delabole and in the Tamar Valley. Chromite, hitherto, has only been found as a rock-constituent very sparingly disseminated in some of the Lizard serpentine.

GROUP 4. *Phosphates.*

The element phosphorus is very widely spread throughout Cornwall; scarcely ever, indeed, is it entirely absent, though the quantities present are always very small, and no deposits of commercial importance have been met with. Commonly, it exists in combination with lime as apatite, which can always be seen, in microscopic crystals at least, in the eruptive rocks; and very often in those which are distinctly of aqueous origin. Crystals of comparatively large size have been found in very many localities, but usually in secondary veins, as for instance, in the granite at Tremearne, St. Michael's Mount, and Stenna Gwynn; in the killas at St. Agnes, and in the hornblendic rocks of Wheal Cock Carn at St. Just. Many different forms of phosphate of copper have been found in the shallower workings of almost all the copper lodes; the phosphate of lead is equally common in the lead lodes, and phosphates of iron have been met with with equal frequency in similar situations, and particularly at Botallack and Wheal Owles in St. Just; at Wheal Jane in Kea; in the Great Perran Iron Lode; and in the tin and copper lodes of the Phœnix Mines near Liskeard. Many of the most beautiful specimens in our museums have thus occurred.

The absolute quantity of phosphorus present in the rocks and veins of Cornwall is probably far greater than that of the fluorine, and some hundreds of times greater than that of the tin. But owing to the absence of considerable local concentrations, it is of absolutely no value to the miner, though it is

likely that the rather exceptional fertility of much of the Cornish soil is dependent upon its presence.

GROUP 5. *Carbonate ores and veinstones.*

Carbonate ores. These are nowhere very common in the district, and in some parts they are entirely absent. Among the most notable examples, the "spathose iron" of the great Perran lode and of the Pawton lode, and the blue and green copper carbonates of the Caradon district may be mentioned. Smaller quantities of these copper carbonates have been found in many of the copper-lodes throughout Cornwall, and very beautiful acicular crystals of carbonate of lead have occurred somewhat sparingly in most of the lead lodes.

The carbonates of zinc, manganese, and bismuth have also been found in a few instances, but only in very small quantities.

Carbonate veinstones—Calcite and dolomite have occurred in considerable quantities in several of the Gwinear mines, and especially in the Rosewarne group; and very beautiful calcite crystals have been found in a great many localities, and especially in the St. Just, Liskeard, Menheniot, and Tamar mines, but seldom in large quantities. The comparative rarity of carbonates in the veins is probably a consequence of the original rarity of limestones in the mining district of the West of England; and the greater abundance of calcite met with in the veins, in going east, appears to be due to the increasingly larger proportions of calcareous material present in the country-rocks; and, perhaps, points to a former westward extension of overlying Devonian limestones. There is little evidence of calcareous springs or of carbonic acid gaseous emanations anywhere in the district, and there is good reason to think that all the carbonates of the veins are either direct infiltrations from the country rocks, or else the results of changes affected by these infiltrations on matter already present in the veins. Speaking generally, we may say that carbonate veinstones are, as might be expected, far more abundant where the veins cut stratified rocks of a known fossiliferous series than elsewhere, while the fossils in the said rocks usually exist near the veins only as cavities or, more rarely, as pyritous or siliceous casts.

The entire absence of carbonates from the veins cutting the granite, and their extreme rarity in those found close to the granite is noteworthy, and would appear to negative, for this district, the now almost abandoned idea that the kaolinization of granite is due to the action of carbonic acid on felspathic rocks*

GROUP 6. *Barium, Strontium, Calcium, &c.*

Barium, so far as is yet known in the West of England, can hardly be regarded as a rock-constituent at all, though it is likely that its silicate compounds would be found, if sought for, in many of the eruptive rocks. As a vein-constituent it is known only as a sulphate. It is abundant in the Teign valley, where it occurs associated with lead-ores; it has also occurred with the lead ores of Wheal Mary Ann and Wheal Trelawney near Liskeard, with oxidized iron ores at Restormel, and with sulphuretted copper ores at Ale-and-Cakes in Gwennap. In all these localities west of the Teign, the barytes has been rather rare, and this rarity is in striking contrast with its abundance in many other well-known mining regions, such as the Rammelsberg in the Hartz, and at Aspen in Colorado.

Strontium is very much rarer than barium, in our district as elsewhere; in fact its compounds have only been found, and that sparingly, at Sidmouth in South Devon (which, indeed, is scarcely within our district at all), and at Binner Downs Mine, near Hayle.

Calcium, as a rock-constituent, not only exists in the great rock-masses of South Devon, but also in many dark lenticular patches in various parts of Cornwall. On the whole, it may be said that it becomes more and more rare in proceeding from west to east, but even in the extreme west there are few rocks which do not contain as much as one-half per cent. In the veins it occurs as calcite, dolomite, and fluor spar as already noted.

Magnesium is an important constituent of serpentine, and of all the basic eruptive rocks, as silicate; but it is very rare in acidic eruptives. It is generally present, but only in small proportions, in the stratified rocks.

* See "Nature and Origin of Clays," *Min. Mag.*, 1888, p. 211.

Cerium is one of the rarest of the elements hitherto discovered, existing, so far as is yet known, in the very rare mineral Churchite, of which only two or three specimens have ever yet been found.*

GROUP 7. *Gold, Silver.*

Gold. I am not aware that this metal has ever been detected in the rock-masses away from veins or cross-courses, but as the same may be said of most of the richest gold regions, the negative fact is not perhaps of much theoretic importance. Few of the metallic ores and gozzans, however, are absolutely free from gold, and in some instances it has been extracted from them at a profit.

Gold, in the metallic state has been found, but only in small quantities, in several of the cross-courses, and in particular at North Molton in Devon, at Wheal Sparnon in Redruth, and in Woolf's cross-course in Breage. It probably exists in many other cross-courses, and perhaps in some of the veins (though if so, it has always been overlooked), for particles of gold have been found in most of the tin-streams of the district: in a few instances, nuggets, of an ounce or more, have been met with. And as most of the iron and copper pyrites, and some of the other metallic ores, contain traces of gold, the aggregate must amount to a very considerable total, though very little of this has ever been extracted by the smelter.

Silver is much more abundant than gold, for though it has not yet been detected in the rock-masses, it occurs in paying proportions in all the lead ores; in many of the ores of copper and zinc; and in some of the gozzans. Occasionally, rich pockets, worth thousands of pounds, have been found in cross-courses near their intersections with right-running veins, especially in the Hayle and Gwinear mines; at Wheal Ludcott and Herodsfoot, near Liskeard; and on several mines in the southern flanks of Kit Hill; as also at Combe Martin in N. Devon.

The earliest accounts of silver from N. Devon (Combe Martin and Beeralston) date from the year 1293, when Wm. de Wymundham, the king's factotum, accounted to the treasury for

* The almost equally rare element *beryllium* has also occurred in Beryl, and as Danalite, each of which contains considerable proportions of the earth berylla.

270-lbs. weight of refined silver ; in 1294, for 521½-lbs ; and in 1295, for 704-lbs. This silver was probably obtained almost exclusively from argentiferous lead ores.

In Cornwall, according to Carne, true silver ores (native silver) were first found in Wheal Mexico (Perranzabuloe) about the year 1778, but it did not pay to work them. The next discovery was at Wheal Herland, in 1801, when £8,000 worth, chiefly native silver but with some sulphide and arsenide, was raised from an intersection of the vein by a cross-course. In 1810 a discovery in a similar situation was made at Dolcoath, and £2,000 worth of ore was taken out in a short time. Other discoveries were made as follows :—

1812. At Wheal Brothers and Wheal Duchy, near Callington, about £3,000 worth of native silver, ruby silver and the gray and black sulphides were taken from a cross-course running N.E., S.W.

1813. At Wheal Alfred a discovery of native silver of considerable value was made. The same year some silver-ore was got from a cross-course at Wheal Bassett.

Other discoveries were made, in 1814, 1815, &c. in various parts of the county.

1861. This year the official mineral statistics were begun by Mr. Robert Hunt, and though always incomplete, yet they have been continued from year to year ever since, with more and more approach to completeness. The following entries appear in the period from 1861 to 1882 :—

Years.	Name of Mine.	Weight of Ore.				Sale Value.		
		T.	c.	q.	lb.	£	s.	d.
1861-4	Wheal Ludcott ..	305	15	3	0	22,583	8	8
1862	Trebisken Green ..	2	7	3	0	158	11	8
1862-77	Silver Vein ..	4	5	1	0	370	0	0
1863	Great Retallack ..	1	10	0	0	44	15	5
1871	The Queen (Calstock)	5	2	1	7	421	12	8
1874-8	Prince of Wales ..	4	5	0	0	31	8	5
1877-9	Wheal Newton ..	241	16	0	3	6,888	5	7
1878	Wheal Brothers ..	0	8	2	17	2	16	5
1877-81	Crinnis & Carlyon ..	29	12	2	7	977	10	5
1880-2	W. Fortune (Harrow- barrow) ..	3	15	3	14	2,610	0	6
		598	19	0	20	£34,088	9	9

If we assume an average produce equal to 400 ounces of silver per ton, which is probably near the truth, the total silver thus accounted for would be a little under 240,000 ounces. This is trivial as compared with the silver contained in the copper and lead ores raised during the same period of 20 years, most of which was extracted by the smelters. Of copper-ores about $1\frac{3}{4}$ million tons were sold, averaging probably $2\frac{1}{2}$ ozs. of silver to the ton, and of lead-ores about 114,000 tons, averaging about 25 ozs., or, together, more than $7\frac{1}{2}$ million ounces.

Notwithstanding, these occasional occurrences of gold, of true silver-ores, and of argentiferous lead and copper ores, it is evident that the district as a whole can neither be regarded as auriferous nor argentiferous in the ordinary sense of the terms. The statistics of gold and silver productions are very imperfect, but it is certain that the whole yield, past and present, has not equalled the yields respectively of a single gold or silver mine of the first rank.

GROUP 8. *Carbon and Hydrocarbons.*

Carbon, in a free state, exists in small grains or scales in a great many of the slaty rocks, as may be seen when their thin sections are examined under the microscope; and even when it is not distinctly visible, its presence may be shewn by the deflagration which ensues when the powdered rock is heated with nitre or chlorate of potash. In some instances, as at Wheal Jane in Kenwyn, and Treamble in Perranzabuloe, I have known it to occur in large flakes, under conditions which suggest an organic origin, while some of the slaty rocks on the south coast near Looe are so highly charged with carbonized fish-remains, that they have been described as "a catacomb of ancient fish." The anthracite of the culm series in North Devon and East Cornwall is the only case in which carbon can be said to be common.

Graphite has been found in small particles and nodules in several of the elvans, but it is always very rare.

Hydrocarbons. Bitumen or asphalt has occurred in several of the mines of Gwennap, Redruth, Illogan, and Camborne, while some of the shales of North Devon and of the Tamar Valley have afforded traces of mineral oil.

On the whole, and excluding the culm series of North Devon and East Cornwall, which lies beyond what is generally understood as the West of England mineral district, it must be admitted that there is a remarkable absence of carbon and its hydrogen compounds from the district under review.

SEC. 14. *On the primary sources of the ore-material.*

1. In the foregoing discussion the expression "deep-seated" has been constantly used. It is easy to refer the origin of certain phenomena to the depths, but not so easy to define what is meant. Nevertheless, the attempt must be made.

By the use of the term "deep-seated," we evidently imply sources which lie considerably below our present deepest workings, and even below the greatest depths we are ever likely to attain in our mining operations, which can hardly extend to more than 4,000 feet. It will, perhaps, be thought reasonable to assume for the upper limit of the deep-seated sources that depth which has a normal temperature of 212° F, and this so far as we know at present must be from 12,000 to 20,000 feet below the present surface.

Another reasonable datum is indicated by Mr. Sorby's well-known observations and calculations.* His conclusion is that the granitic rocks of widely separated districts must have solidified from a state of pseudo-fusion at temperatures approximating to 680° F., and while subject to pressure equal to from 32,000 up to 78,000 feet of rock. More basic and therefore more fusible rocks must of course have solidified at much less depths, or under much lower pressures, while it may well be in some instances that the lower limit of solidification of acidic rocks lies still deeper. Still, it would seem that a depth of 130,000 feet, or say 25 miles, can hardly fail to include all that can be called solid in any proper sense, and this is the limit of our circulation-zone properly so-called. Beneath this all the geological, and much of the physical evidence indicates that there is a zone of rock-substance existing in a state of pseudo-fusion from the abundant presence of highly-heated aqueous solutions charged with all kinds of metallic and non-metallic substances, all of which are in the

* Structure of Crystals, *Quart. Jour. Geol. Soc.*, 1857.

"critical state," ready to flash into the vaporous condition as soon as the pressure is in any way relieved. Such vapours must at once fill any fissures or "chimneys" which may be formed from time to time in the circulation zone, and must there be speedily condensed as they make their way outwards, depositing successively their mineral contents; and, finally must issue in many cases at the surface as comparatively pure water.

2. The extremely local limitations of many very important mineral substances seem to indicate that beneath the solid crust or "circulation-zone," there are not merely two distinct layers of fused rock-substance—the one acidic, the other basic, as long ago suggested by Durocher, but that there are many separate areas—each characterised by the greater abundance of one or more elements. And furthermore, as these are probably nowhere within the depths here considered, in a state of true fusion, but only in a pasty condition, any large withdrawal of matter, by means of volcanoes or otherwise, could hardly fail to leave cavities filled only with highly compressed vapours of the more volatile components of the rock-mass, so affording very favourable conditions for marked differentiation. We have seen that even in a small district like ours, the elements present are very irregularly distributed, while some important compounds which are elsewhere very common, such as chlorides, bromides, and iodides sulphates, borates, and nitrates, are with us very rare or altogether absent. The same is true of a whole series of metals, and particularly of mercury and platinum, which, if actually present, could hardly fail to be detected.* The comparative abundance of such substances as arsenic, tin, and boron in the form of the characteristic fluo-borosilicate tourmaline—substances which are almost entirely wanting in many very important mining districts, is also particularly worthy of notice. The last-mentioned substances occur in a sort of "granitic penumbra" as it has been termed by St. Claire Deville, as if they had separated from the main mass, and become concentrated on its outer surface during the processes of solidification and cooling; at the same time impregnating the killas for short distances from the junctions.

* The several times reported occurrences of quicksilver in the valley of the Exe still need confirmation.

The knowledge thus afforded as to the constitution of the outer portion of our globe is not inconsiderable, for it would seem that the existence of distinct gold districts, silver districts, tin districts, and the like must indicate local subterranean differences, whether these metals have been derived from the country rocks by lateral secretion or from below by ascension; though we must not lose sight of the fact that they tell us nothing, or next to nothing as to the condition of the great mass of the earth's interior.

3. It has, perhaps, been sufficiently urged in the foregoing sections that the valuable contents of the workable ore-deposits, together with most of their accompanying "vein-stones" have often been derived by processes of solution from the adjacent rock-masses, and deposited after more or less of wandering and transference; sometimes without change, at other times in entirely new forms; as natural concentrations, in veins, cavities, and shrinkage-cracks; or as pseudomorphous replacements.* But, whenever the openings favouring such concentrations extend downwards far enough to communicate with the zone of pseudo-fusion, they must at once become channels through which other mineral matters can arise, and it is evident that many of our most important deposits have been formed by this more direct method of ascension. In particular, it would seem that the greater part of the tin, tourmaline, and fluor-spar, as well as most of the metallic sulphides found in the veins of the West of England, have come up through the weakened zones of rock produced by the granitic and felsitic intrusions.†

The deposits just referred to were, indeed, more directly ascensional than some others, but not more really so. For the ore-charged intrusive rocks which have yielded useful concentrations come from below by hypothesis; and any ore-charged sedimentary rocks which may have existed before those rocks

* Credner has remarked that the mineral matter of the veins in granite in Saxony is not (immediately) derived from deep seated sources, but from the partial decomposition of the adjacent rocks by the infiltration of water. See "Die Granit Gänge," *Zeit d. Deutsch. Geol. Gesells.*, 1875.

† I have a suspicion that some of the killas was already stanniferous before the granitic (or at least the felsitic) eruptions began—as in the case of some of the stockworks already described.

were intruded, must equally have been charged more or less directly from below, as will be shewn immediately.

4. The somewhat different relations of copper to the eruptive rocks as compared with tin; and the very different relations of lead, antimony, and other metals, have already been referred to. These metals, except in the shallower portions of veins, where they are in most cases obviously of secondary formation, occur generally as sulphides. The deep-seated source of the sulphide minerals has been already referred to, but it has been urged that sulphides of iron, copper, zinc, lead, and antimony could not exist at the high temperature requisite for the fusion or pseudo-fusion of such rocks,* and hence that subsequent impregnation or mineralization is indicated whenever such sulphides are observed in eruptive rocks. But although such a subsequent impregnation is possible enough, and likely enough in many instances, there are others in which the original presence of sulphides as rock-constituents is plainly indicated. In any case, the argument seems to have but little force, for while under great pressure, and in the absence of free oxygen, it is hard to see how sulphides could be decomposed, if they already existed as constituents of the semi-fused masses beneath the circulation zone. In fact, the existence of copper and iron sulphides as evident original constituents of eruptive rocks has been established by direct observation in many countries, and by several observers.†

5. Though the formation and change of our mineral deposits cannot be said to have entirely ceased even now, the most active periods of interaction terminated long ages ago, when what is now the surface, was covered by thousands of feet of rock which have since been removed by denudation. It is generally admitted that the granitic rocks were forced into or

*"It is well-known that iron-pyrites cannot exist at the temperature of fused granite." R. Pearce, "Influence of lodes on rocks," *Rep. Min. Assoc. of Corn. and Devon*, 1864.

†The eruptive-garnet rocks of New Mexico, Arizona, and Chihuahua, contain chalcopyrite in some cases as a sort of base in which garnet-crystals have been formed, and in other cases the garnets enclose "shots" of chalcopyrite just as shots of copper are found in a copper-matt.

through the killas in post-carboniferous times.* But it is also certain that there had been much earlier and very protracted periods, during which the intrusions were in part real ejections, and chiefly basic, viz., the "dunstones" and "greenstones." During these earlier troubled periods, some post-Devonian and others far earlier, it is reasonable to suppose that the surrounding seas became more or less charged with metallic salts, so that the stratified rocks then being formed, could not fail to be impregnated with them, as also those lying immediately beneath, if they were at all of a porous character.† This hypothesis may, perhaps, account in some degree for the rarity or entire absence of fossils in the distinctively mining regions of the West, though there are of course well-known cases where newer-formed lodes traverse highly fossiliferous rocks, as at Crinnis. Afterwards, the long series of granitic intrusions took place which not only brought up new supplies of ore, and especially of tin, but opened up cavities, into which subsequent segregations took place.

This local charging of isolated seas and lakes with metalliferous substance, is a common circumstance even now, and it must have been much more common in the earlier geologic periods. M. Dieulfait has dealt with this subject very fully on many occasions; thus, in a lecture delivered before the *Association Scientifique de France*, in 1883, he urges that the terrestrial waters are the source from whence the mineral substances found in lodes (*i.e.* lodes traversing stratified rocks) have been gathered and concentrated. Mr. J. A. Phillips also devoted some attention to this subject, and he stated as an illustration of the extent of such operations in recent times that no less than 80,000 tons of copper have been carried into the sea from the Rio Tinto Mines alone since the Roman times.

In a really good mining region, therefore, it is hardly too much to say that all the rock-masses, whether eruptive or stratified, contain or have contained, diffused throughout their sub-

* This is certainly so as to the Dartmoor granite; it is not so certain that all the granite masses were intruded at the same time, but if not, those of Cornwall were probably earlier rather than later.

† "The waters were so strongly impregnated with chemical solutions from mineral springs, that nothing could live." See *Jour. Roy. Inst. Corn.*, 1884, p. 166

stance, more or less of the ore-material sought by the miner. This is expressed by him in the phrase "mineralized ground."

6. If then we consider that the ore-deposits were, in the main, formed as we now have them, at depths of many thousands of feet below the present surface and that we are now only able to command at most 4,000 feet of depth, it follows that our working zone forms but a very insignificant portion of the original circulation-zone. Consequently we have not much reason to expect any marked general increase of richness, as the workable zone is followed for a few hundred feet in any given mine, except so far as it is due to (*a*) comparatively recent and local enrichments above the water-level from downward percolation or upward efflorescence, and (*b*) to the coming together of converging veins. The general enrichment which miners usually believe in is easily accounted for, so far as it has any reality at all, by the fact that veins which are not found to be especially rich as they are followed down, are soon abandoned perforce in most instances owing to the greater cost of working.

Variations of richness, as well as of mineral character, will of course be constantly noticed, both in depth and laterally; the reasons for such variations have already been fully set forth; but in the absence of definite knowledge as to the varying characters of the rock-masses themselves, in age, composition, structure, permeability, &c., it would seem that, setting aside the exceptions noted above, the chances of improvement are practically equal to those of deterioration in any given case as greater depth is attained.

CHAP. IV.—DETRITAL ORE DEPOSITS.

SEC. 1.—*Definition.*

All clastic rocks, such as conglomerates and sandstones, and even some clays, may be regarded as detrital deposits, whatever may be their geological age. But the term is by custom generally restricted to the but little consolidated sands and gravels of the later geological periods. Such beds are often found to contain distributed particles of ore-matter, apparently derived from pre-existing rocks; and when these occur in workable quantities or nearly so, the beds themselves may be classed as detrital ore-deposits.

In the West of England the only important examples of such beds are the slightly auriferous tin-gravels, which, originating for the most part in the granitic uplands, formerly occupied the lower portions of many of the valleys, though buried under still more recent deposits devoid of tin.

We may say now, as Mr. Henwood said nearly 20 years ago, that, having been wrought from remote antiquity they are now nearly, but not quite exhausted. In particular, such gravels are known to exist unwrought in the seaward extensions of several of the valleys on the south, and in one instance* an extensive engineering operation was undertaken to open up such a deposit, but the project did not result in a financial success.

The detrital tin-deposits of Cornwall have been very admirably described by a host of observers, among whom may be particularly mentioned the names of Colenso, Budge, Prideaux Carne, and Pattison; but especially Mr. Wm. Jory Henwood, whose Presidential address to the Royal Institution of Cornwall, in the year 1873, dealt exhaustively with the subject. Mr. Henwood described with more or less of detail, and from his own personal observations, more than 20 different stream works, and gave many references to the descriptions of previous writers.† In all of these the richest "tin-ground" was found resting directly upon the solid rock beneath, the "shelf," or "bed-rock." This was usually covered with several alternating layers of peat or vegetable-mould and sand or gravel. Sometimes an upper and poorer layer of tin-ground occurred resting on a "false-shelf," not far beneath the surface, the components of this upper layer being, as Mr. Henwood observes, generally less completely rounded than those of the true tin-ground. He also observes, that the components of the tin-ground generally are more rounded in proportion to their distance from their elevated sources; and furthermore, that the more elevated tin-grounds resemble in mineral character the rocks upon which they rest, while those nearer the mouths of the valleys have no such resemblance.

* At Restronguet, about 20 years ago. See *Taylor, Proc. Inst. Mech. Eng.*, 1873, p. 175.

† See *Jour. Roy. Inst. Corn.*, 1873.

SEC. 2.—*Classification of tin-gravels.*

Detrital tin-ore occurs in the West of England under the following conditions :—

a. As a constituent of river-gravels and sea-beaches now in process of formation. The tin-ore here referred to is generally in very small particles, often angular, or sub-angular. Where it is the result of natural processes of denudation, and consequently has been liberated from its matrix with extreme slowness, as on some of the isolated beaches near St. Agnes, it is very pure; but where it results from the more rapid operations of the miner, as in the bed and at the mouth of the noted Red River which divides the parish of Illogan from Camborne, it is extremely impure from the presence of pyrites, mispickel, wolfram, chalcopyrite, and other more or less readily decomposable minerals. These impurities no doubt existed to some extent in the veins from which the true “stream-tin” appears to have been derived, but have been removed gradually by natural chemical as well as mechanical processes acting through immense periods of time.*

(*b.*) The elevated stanniferous quartz gravels, such as those of the “Blue Pool” in Crowan, referred to by Mr. Tyack,† and those of St. Agnes Beacon, mentioned by Messrs. Kitto and Davies.‡

* The stanniferous refuse from our mines would, indeed, form rich and important detrital deposits in the Red River and other valleys, and in the shallows at their mouths if they were left to themselves. But such deposits would differ as largely in character as in origin from the true tin-gravels which were formed entirely by natural agencies without help from human operations. Tin-streaming in the proper sense of the word is now so nearly extinct in the West of England, that the term has come to be applied to the very different mode of working adopted in the Red River, the Wheal Vor valley, and other places with the object of recovering some of the tin which escapes from the mines as “slimes” and “rows.” Some modern writers have been entirely misled by the modern use of this term. Thus, Prof. Blake writes, “The larger part of the tin of commerce is obtained from “stream-tin. In Cornwall at first the tin ore was obtained solely from the alluvions of the tin-region, and *even so late as 1876, it is reported that 800 persons were engaged in mining for stream-tin on the Red River.*”—W. P. Blake, *Tin Ore of the Black Hills, Eng. and Min. Jour.*, New York, Sep. 1883. The italics are mine, and of course the statement so marked is an absolute error of the Professor’s.

† *Trans. Roy. Geo. Soc. Corn.*, ix, p. 177.

‡ *Ibid.*, p. 196.

(c.) The stanniferous "head" of angular debris which forms occasional portions of the "overburden" of the China Clay districts. This is often found at elevations, not only considerable in themselves, but relatively as compared with the surrounding country. The components differ as a whole from those of the quartz gravels, above referred to, in being much less water-worn. Some of the fragments are very large, and the whole mass is, so to speak, cemented together with an earthy or clayey mass of filling, which has considerable tenacity. It occurs covering killas as well as granite. Grains of tin-ore are often found widely distributed through the subsoil in similar localities, even when there is no stony "head" properly so-called. Such subsoils may or may not be of the same age as the "head" proper.

(d.) The true stanniferous valley gravels, sometimes, as already stated, consisting of two distinct beds separated by layers of different material, indicating a very considerable lapse of intervening time. The true gravels occur at all elevations up to nearly 700 feet, but always in situations relatively low, *i.e.* in the immediate neighbourhood of ground of greater elevation. These are the deposits now practically worked out, which were so fully described by Mr. Henwood.

SEC. 3. *Geological age of the gravels.*

In 1859, Mr. S. R. Pattison endeavoured to correlate these various deposits in some degree, and to connect them with the traces of man in the district, just as Dr. Winn had done so long ago as 1839.* The order of origin of the various beds as stated by him, agrees pretty nearly with that given above, and he places the important Forest bed between *c* and *d*. Much more recently Mr. Ussher after a close study of the superficial geology of the county, has come to the conclusion that both the "head" and the principal stream-tin gravels were formed during a period of elevation, of subsequent subsidence, and of sub-aerial waste corresponding to the second glacial period,† while he finds the first traces of man in the immediately succeeding Forest-bed. But how long ago this was, we do not at all know. Some geolo-

* See the *Rep. Roy. Inst. Corn.* for 1860, p. 5, *et seq.*

† *Post-tertiary Geology of Cornwall*, 1879, p. 50.

gists call for many thousands of years, because human indications have been found buried in detrital accumulations at considerable depths below the present surface. Such a conclusion would seem to be but little warranted in view of the evidence we have of rapid accumulation in our lower valleys. Thus, a crucifix, certainly an article of very modern date from a geological point of view, was found at the bottom of Carnon Stream Works in 1812, at a depth of about 30 feet below the bed of the river*. Still, the antiquity of the gravel formations must be vastly greater than that of their first working by man, and it has been shewn conclusively by Mr. Worth and others, that tin-working has gone on in Cornwall, for certainly 3000 and possibly more than 4000 years.† Our Museum is probably richer in objects of interest illustrating the early tin-streaming industry than any other museum in the world.

SEC. 4. *Mineral Associations.*

The detrital tin-ore of the West of England occurs as crystals, pebbles, sub-angular masses, and water-worn grains of cassiterite, sometimes associated with similar fragments of iron-pyrites and other "heavy" metallic minerals, and occasionally with small particles or even small nuggets of gold. The cassiterite is sometimes attached to fragments of granite or slate, or to pieces of quartz, felspar or other veinstone, but more commonly it is free from such attachments. In any case, it forms but a very small proportion of the "tin-ground," rarely exceeding five *per cent.* of its mass, and often not so much as one-tenth of one *per cent.*

Whatever may be the thought of the hypothesis which has once and again been put forward that some of the tin consists of concretions formed *in situ*, we must in the main conclude that the gravels and their included tin particles have been formed by the crumbling and wearing away of rocks enclosing tin-veins. We are led to this conclusion by comparing the tin-associates in the gravels with similar associations in known veins, which in

* Barham, *Rep. Roy. Inst. Corn.*, p. 6.

† Worth, *Antiquity of Mining in the West of England.*

„ *Progress of Mining Skill.*

„ *Ancient Mining Implements.*

the West of England are much the same as in other tin-producing countries.* In the following lists of minerals found associated with cassiterite in the different kinds of country rock in the West of England, I only refer (*a*) to those which appear to have been formed contemporaneously with the cassiterite, and (*b*) to those which have been observed in immediate contact with it and mostly deposited on it.

GRANITE.—Here the most usual associates as thus defined are—in the *a* class, besides the constantly occurring *quartz*, *felspar*, (orthoclase, usually more or less kaolinized) *mica* (lepidolite, lepidomelane, and Gilbertite), and *tourmaline*; less frequently *wolfram* and *stannite*; occasionally *topaz*, *apatite*, *scheelite*, *fluellite*, *Tavistockite*, *Churchite*, and *molybdenite*. In the *b* class we have, *quartz*, *mispickel*, *pyrites*, *chalcopyrite*, *smaltite*, *blende*, *bismuth*, *bismuthenite*, *hematite*, and *limonite*, with, occasionally, *native copper*, *pitch-blende*, and *uranium-ochre*.

ELVAN (Quartz and felspar-porphyrries.)—Here in the *a* class, *quartz*, *felspar*, *tourmaline*, and *mica* as in the granite; in the *b* class, *quartz* and *hematite*.

KILLAS (clay-slate, tourmaline-schist, “knoten-schiefer,” &c.) Cassiterite occurring in these rocks is almost invariably associated with *quartz*, and microscopic or macroscopic *tourmaline*. In the *b* class we often find *chalcedony* (Pednandrea, East Pool, &c.) *chlorite*, *mispickel*, *pyrites* and *wolfram*; more rarely *chalcopyrite*, *smaltite*, *cobaltite*, *hematite*, *limonite*, *blende*, *chalybite*, and *Gilbertite*; still more rarely, *pitchblende*, *pearl spar*, *pharmacosiderite*, *uranochre*, *chalcosiderite*, *Henwoodite*, *Andrewsite*, *olivenite*, *topaz*, and *apatite*.

HORNBLENDIC SLATES (pseudo-greenstones.) Tin is rare in such rocks, but when it does occur, it is associated with *hornblende*, *actinolite*, *apatite*, *epidote*, *axinite*, and *garnet*, of the *a* class; and *magnetite*, *hematite*, *chalcocite*, *chalcopyrite*, *diallogite*, *Penwithite*, *carbonate of bismuth*, *calcite*, *Dolomite*, *olivenite*, *scorodite*, and *pharmacosiderite* of the *b* class.

GREENSTONE (Diorite.) In this rock the occurrence of tin is very rare, but occasional veins occur associated with *chlorite*, *limonite*, and other products of change.

* e.g. Saxony, Bohemia, Brittany, Spain, Banca, New South Wales, &c. &c.

The minerals found with the tin in the gravels are just such as would result from the degradation of such associations. The trituration, concentration and atmospheric exposure to which the tin-bearing rocks have been exposed would naturally result :—

(a) in separating to a certain extent all substances of lower specific gravity.

(b) in oxydizing all such sulphides as are liable to such a change ; and this would be followed in most cases by the removal of the oxydized products.*

SEC. 5. *Proximate origin of the gravel-tin.*

The remote sources of the tin have been discussed in chap. III, sec. 14, we have now to consider the more immediate sources of the tin found in the gravels. The wide distribution of tin in the rocks of the West of England has been already referred to in the same chapter, sec. 13. It may be detected by careful chemical analysis in most, probably in all of the granites and elvans ; it is constantly present in tourmaline schist as well as in much of the killas which abuts against the granite. With no more delicate implement than a vanning shovel it may usually be found in the mud of the parish roads in the tin districts ; † in the rock-substance lying between the separate tin veinlets at Minear Downs, Mulberry and Great Wheal Fortune ; in the overburden at Tregoning Hill, Rock Hill, and Treviscoe ; and in the sands of the sea-beaches at St. Agnes and Cape Cornwall. It is probably not too much to say that the whole of the granite and killas lying within one mile of the granite junctions contains from $\frac{1}{100000}$ to $\frac{1}{1000000}$ of its weight of oxide of tin, exclusive of that contained in well-defined veins. It is true that most of this exists only as microscopically minute particles, yet there are occasionally veinlets (themselves representing natural local concentrations of such diffused particles) of a larger grain, and capable of supplying such fragments as are met with in the tin-gravels. And as the

*It is owing to this process that the true stream-tin is generally purer than that obtained direct from the lodes. Conversely the tin from the modern stream works (Red River, &c.) being the refuse from the veins is less pure than the ordinary lode tin.

† I have found 1 to 4 lbs. to the ton in the mud of the road between St. Austell and Bodmin.

killas now bordering the granite is richer than that situated at a greater distance, so too in all probability was that which formerly covered it as with a blanket, and which has since been denuded away.

SEC. 6. *Situation and extent of the West of England tin-gravels.*

It is certain that during the past seven centuries the tin-gravels were found to be more extensive and richer in the central and western parts of Cornwall, than in the rest of the West of England mining district, and there is much reason to believe that this was so from the first. And as the western gravels were probably the first to be worked, so they have continued in work right up to the present, though on a very small scale, being now in fact almost exhausted. Of over 20 distinct stream-works visited by Mr. Henwood while in work, all were situated to the West of Bodmin. In nearly all of these more than one tin-bed existed, and whenever this was the case the lower bed, separated from the upper by "false shelf," peat, or other stratified material, was by far the richer, and often it was the only bed worth working.

We may, perhaps, form a rough estimate of the quantity of tin originally present in these gravels from the following data :—

1. Area of tin-ground above present sea-level in Cornwall.

Penzance district	..	..	10 square miles.
Helston	..	..	5 „
Restronguet	..	..	5 „
Pentewan	..	..	5 „
Levrean and Luxulyan	..	..	15 „
Bodmin granite	..	..	30 „
Tregoss Moor	..	..	10 „
Kit Hill District	..	..	20 „
Various outlying	..	..	20 „
			— 120 „

2. Do. in Devon :—

Dartmoor and its surroundings.. 70 „

3. Beneath the sea-level, extensions
of the Pentewan and other } 150 „
valleys

—
340 square miles.

Taking the average thickness of the tin-ground at eighteen inches, this would give 526,592,000 cubic yards, or say 1,000,000,000 tons. Supposing one four-hundredth of this (one-fourth of one per cent.) to be oxide of tin, this would give two and a half million tons of black tin. Of this large amount probably four-sevenths have been almost completely worked away, while the remaining three-sevenths are practically inaccessible.

I have shewn elsewhere* that the black tin produced in the West of England during the past seven centuries has been not less than two millions of tons of which the stream-works must have yielded about three-eighths, or say 750,000 tons. Allowing only half as much for the preceding (perhaps more than) 30 centuries; allowing for small patches of tin-ground still unworked; and for the tin washed away in the streaming process, as well as for the inaccessible submarine deposits still unworked, it will be seen that there is still a sufficient margin in the estimate given above.

SEC. 7. *Amount of denudation indicated.*

Assuming that the tin-gravels before they began to be worked, contained $2\frac{1}{2}$ millions of tons of black tin, we have now to enquire how much denudation is thus indicated. In Chap. III, Sec. 13, I have estimated that what may be called the "effective tin-bearing area" of the lodes at a given level is equal to half a square mile, and capable of yielding 40,000 tons of black tin per yard of depth. Let us assume farther an area of "stanniferous penumbra" formerly existing but removed by denudation during the formation of the tin-gravels ten times as large (viz., 5 square miles) but only one-tenth as rich, this would give us another 40,000 tons. Add to this a "slightly impregnated area" of 200 square miles, but only capable of yielding one-hundredth as much of grain-tin as the penumbra area, we should then have :—

* Seven Centuries of Tin Production, 1892.

Half a square mile of "effective area" yielding	
per yard of depth, of black tin	40,000 tons.
Five square miles of "stanniferous penumbra,"	
yielding per yard of depth	40,000 ,,
Two hundred square miles of "slightly impreg-	
nated area," yielding per yard of depth ..	16,000 ,,
	<hr/>
Total	96,000 ,,

This total of 96,000 tons being derived from $205\frac{1}{2}$ square miles of stanniferous rocks for each yard of denudation. Now, supposing two thirds of this tin to have been collected and retained in the 340 square miles of gravel deposit as above estimated, the remainder being ground into "slime" and carried away during the denuding process, an average of about 40 yards of denudation would have been required to yield the $2\frac{1}{2}$ millions of tons originally contained in them, and this large amount of denudation must have been effected between the "Pliocene" and "Prehistoric" (Postglacial) times. A similar series of operations must have gone on during many previous ages, the results of which are no longer within our ken. But it is evident that stanniferous debris must have been very widely distributed over the sea bottom. The imagination is lost in trying to follow such residues, which have probably been again and again denuded and re-consolidated, but it is clear that the sediments of the seas around the West of England must contain traces of tin spread over many thousands of square miles.

SEC. 8. *Relation of lodes to detrital deposits.*

In a former section (Chap. III, Sec. 13,) the workable tin contained in fifty stockworks, averaging 250 yards long and 20 yards wide, has been estimated rather to exceed that contained in 1000 lodes (with their branches) each 1000 yards long and one yard wide. A rough calculation will enable us to compare the relative contents of definite lodes, and of what may be called stanniferous zones of disseminated tin, in another light.

The productive part of the Dolcoath lode may be taken at 2500 fathoms long, with an average depth for the tin producing part, so far as it has yet been explored, of 200 fathoms, and an average thickness of one fathom. Thus we have $2500 \times 200 \times$

1=five hundred thousand cubic fathoms, and reckoning 5 cwt. of the fathom, a total of 125,000 tons for the depth specified, or 50 tons per fathom of length, which is, perhaps, not far from the truth. But a single stockwork 250 fathoms long \times 10 fathoms wide, if it yields only 5 lbs. of tin to the ton, or say 80 lbs. to the cubic fathom will, if worked to the same depth of 200 fathoms yield 17,850 tons, or an average of over 70 tons per fathom of length.

A reasonable consideration of the foregoing figures and estimates will shew that it is a great error to suppose, as many have done, that rich detrital deposits imply the former, if not the present, existence of rich lodes within the denudation area. Rather, it would appear that the reverse is the case, and in our estimates we have only supposed about 40 per cent. of the tin to have been derived from regular lodes, and this is probably too high an estimate.

On the other hand, the existence of large *masses* of ore in the detritals may generally be taken to indicate the near existence of large deposits.

SEC. 9. *Summary.*

a. The tin-gravels, whether near to or below the present sea-level, as at Carnon and Pentewan; or at considerable elevations as at Tregoss Moor or near Princetown; occupy ground which is relatively low, *i.e.* lower than much of that which is adjacent.

b. They consist of matter denuded from those higher grounds or from others not far off, and at still greater elevations.

c. The richness of the gravels has little or no direct relation to that of the principal *lodes* of the near neighbourhood.

d. They represent actual concentrations, *i.e.* they are largely composed of the heavier portions of masses of rocks whose denudation must have occupied long periods.

e. They seem mostly to have been derived from granitic rocks, with some admixture of such altered killas as may be seen near the junctions.

f. The absence of auriferous gravels, workable as such, in Cornwall, supports the conclusions in Chap. III, Sec. 13, that Cornwall was never an auriferous region in any proper economic sense.

g. The valleys in which the gravels lie, after leaving the granite, were eroded at a period when the sea-level was, relatively to the land, far lower than it is now.

h. The valleys seem to have been swept clean before the tin-gravels found their way into them in many cases.

i. Although there are in a few cases, evidences of a second, or even of a third stanniferous layer of gravel, yet the lowest is always by far the most important.

j. Though the physical changes in the West of England have been so considerable since the tin-gravels were laid down, they must yet be regarded as of Post-tertiary age.

k. The occurrence of mining implements and other remains of the ancient tanners at great depths in the valley deposits agrees with the historical indications of the great antiquity of mining in the West of England.

l. There is distinct evidence that in some instances at least very considerable thicknesses of "overburden" resting upon the tin-gravels have been accumulated within comparatively short periods.

m. The actual proportion of oxide of tin present in the valley deposits is very small.

n. It represents, nevertheless, a very large amount of denudation.

[*To be continued.*]

NOTE.—Pages 327—377 in the *Journal*, No. 39, passed through the press during the absence of the author in America, consequently there are several misprints of minor importance, and a few more serious errors, which should be corrected, as follows:—

- | | | |
|-----------------------------|-------------------------|-------------------------|
| p. 327, line 7 from bottom, | for <i>marked</i> | read <i>masked</i> . |
| p. 349, line 10 from top, | for <i>radule</i> | „ <i>radicle</i> . |
| p. 352, line 22 | „ for <i>nautical</i> | „ <i>natural</i> . |
| p. 360, line 2 | „ for <i>crumblings</i> | „ <i>constituents</i> . |
| p. 371, line 21 | „ for <i>Daniel</i> | „ <i>Damsel</i> . |

THE RUDE STONE MONUMENTS OF CORNWALL.

BY R. N. WORTH, F.G.S., Cor. Mem.

PRELIMINARY.

Although so much has been said and written on the fascinating topic of the Rude Stone Monuments of Cornwall, the subject is very far from being exhausted. Indeed it cannot be said, even after centuries of more or less accurate observation and investigation, that all the materials are yet to hand. True, most of these monuments have long been known. True that, for the most part, they have been carefully examined and described. Still, fresh facts and illustrations are always coming to light; and there are directions in which further research seems likely to be fruitful of very important results.

Under the head of Rude Stone Monuments, for the present purpose I include: 1—stone circles; 2—menhirs; 3—kistvaens; 4—cromlechs or dolmens; 5—holed stones. Of the large stone circles and of cromlechs, Cornwall contains more examples than any other county in England. Whether it possesses also examples of the stone rows, which are more common on Dartmoor than in any other part of the world, so far as is known to the antiquary, is a point as yet unsettled.

My special object is to endeavour to ascertain, as far as may be, what these monuments have to say for themselves. There have been abundant speculations, a most plentiful crop of hypotheses, a wideness and wildness of suggestion often bordering upon the ridiculous. Many a plausible theory has rested on no sounder basis than an erroneous description, or the insistence on the essential character of an isolated peculiarity. There has been too great readiness, also, to press into service traditions which by no conceivable means could be made to synchronise; to regard statements as authoritative which merely embodied the guesses of writers, far removed from us, indeed, in point of antiquity, but having no more direct knowledge of the true facts than ourselves.

It seems to me that the wisest course in these matters is to bring all the examples of each class of monument, so far as possible, under review, in order to ascertain their common features. Then, to interpret these by the facts of human nature. In these features, it is evident, their purpose and meaning must be found—if it be found at all. The true theory must be capable of universal application. Variation must always be regarded as an accident, not an essential. Unfortunately, however, many of the hypotheses which have been proposed—indeed the greater number—have been the plain result of laying undue stress upon exceptional characters. Such characters have their interest—they may have their value; but their place is subordinate. The fact that a man has eyes, is of more importance than their colour. The points that differentiate a building, between a human-dwelling on the one hand and a cattle-shed on the other, are more significant in principle than the variations between one dwelling and another—great as these may be.

STONE CIRCLES.

What then, in the first place, are the points common to the Stone Circles of Cornwall—or, in other words, what are their essential features as a class of rude stone monuments? Two points strike us at once.

In the first place, their shape is more or less circular.

In the second, they are formed of stones set on end, at varying distances from each other.

These two characteristics are self-evident; what can we find more?

It is clear that a feature which varies so considerably as their size, cannot be an essential. The largest circle in Cornwall is the Stripple Stones, $148\frac{1}{2}$ feet in diameter; and this is closely followed by the Fernacre, of 146, and the Stannon, of 138 feet. Next come the three Hurler circles, respectively 135, 110, and 105 feet. The Trippet Stones are $104\frac{1}{2}$ feet over, and the Leaze circle $83\frac{1}{2}$. These are all in East Cornwall; with the Duloe circle of $36\frac{1}{2}$ feet.

The largest circle in West Cornwall is that of Boscawen-ûn, 80 feet; closely followed by the Bolleit circle, $75\frac{1}{2}$ feet. The Boskednan circle is nearly $69\frac{1}{2}$ feet, while the chief Tregaseal circle is 65 feet, and the chief Wendron is put at 52.

Cornwall, therefore, yields examples of stone circles varying in diameter from twelve yards to fifty, the interval being filled by circles—to render the dimensions more easy of comparison by putting them roundly—of seventeen, twenty-two, twenty-three, twenty-five, twenty-seven, twenty-eight, thirty-five, thirty-seven, forty-five, forty-six, and forty-nine yards.

Beyond the fact that the circles of East Cornwall—the Duloe excepted—are larger than those of West Cornwall, it is impossible to glean any general deduction from these figures. There is nothing to suggest that a difference in size indicates a difference in origin or in purpose; a conclusion we should never dream of drawing—for example—from the varying sizes of the dwelling-houses of the present day. There is nothing, in short, to justify the hypothesis that the larger circles are “sacred circles,” or are in any way distinguished, save in size, from the smaller or presumably “profane.” We shall see, by and by, that Devon will supply not merely still smaller circles, but fill up sundry of the greater intervals in the Cornish list; while Wiltshire will yield the biggest circles known.

Next, as to the number of stones forming the circles. In many cases this is by no means clear; but as a rule it can be ascertained with sufficient accuracy for our present purpose. There has been a frequent suggestion that these numbers have a mystical meaning; and because it so happens that there are, at present, nineteen stones each, in the Boscawen-ûn circle and in the Bolleit (Borlase claiming also Tregaseal and Boskednan), the late Mr. R. Edmonds, with others, proposed a connection with the Metonic cycle, which, if proved, would both indicate the approximate date of the circles and reveal their object. But, were this so, the number nineteen, singly or multiplied, would be essential, whereas the Bolleit circle is the only one in Cornwall in which the nineteen stones are certainly original—the Boscawen being manifestly incomplete,—nor is the nineteen more clearly indicated elsewhere. Of none of the other West Cornwall circles can the number be ascertained with accuracy, but there is no reason whatever to suppose that it was nineteen rather than any other figure. And on the other hand it is perfectly clear that the East Cornwall circles all had more, ranging, in the case of Fernacre, up to an observed sixty-four, and, in that of Stannon, to 76;

while the Hurlers are calculated to have had originally from twenty-six to thirty-three. The Duloe circle only retains eight. Stone circles on Dartmoor vary in number between ten and thirty-six; and it is plain that in some of them there must have been more; while in Cumberland we reach eighty-eight.

It is therefore perfectly evident that the number of stones in the circles cannot be essential. It varies, as common sense tells us it would naturally vary, with the dimensions of the circles, and in a smaller degree with the dimensions of the stones.

Neither the size nor the material of the stones, present any distinctive features, so far as Cornwall and Devon are concerned, Some of the stones used in the Cornish circles are quite insignificant; and examples are found of all dimensions, between hand-stones and the 11 ft. 9 in. member of the Stripples Stones. The average size may be put at from three to five feet. As to material, in the West of England the stones are invariably those of the locality, chiefly granite, occasionally quartz, or, as in some Devon instances, a local gabbro. Indeed the only exception to the rule, that circle stones are of local origin, that I am aware of, in the country, is that of the inner and ruder circle at Stonehenge, which must call for its own special explanation.

So far, then, we have been unable to get beyond our first two postulates. It is clear that there is nothing to guide us either in the size of the circles, or the number or character of the stones forming them.

But of late years attention has been called to their presumed orientation, in respect to which very ingenious hypotheses have been framed by Mr. A. L. Lewis. Now, it is impossible to orientate a circle, save with reference to some extraneous feature; and, if orientation be an essential, this feature must always have been present. At Stonehenge it is presumed to be the menhir called the Friar's Heel, immediately behind which it is noted that the sun may be seen to rise, when viewed from the so-called "altar stone" in the centre of the circle, on the longest day. Much the same result, though less exactly, is claimed to have been observed with regard to other important monuments of this class, as at Stanton-Drew near Bristol, and Arbor-Low in Derbyshire, and I think that some tendency must be admitted, though the explanation is open to discussion.

With regard, however, to either the Cornish or Devon circles I fail to find such evidence. There is, to the best of my observation, no circle in Cornwall so placed, relatively to the menhirs which at times accompany them, as to indicate more than a vague and very inaccurate orientation, so far as summer sunrise is concerned, at the best.

Mr. Lewis's hypothesis, however, allows of the use of hill tops and hill gaps and other prominent points of the landscape, for its support; and, this being so, it seems to me matter of some surprise that his efforts to establish the position are not more successful. It surely must be evident, on the smallest consideration, that a *circle* can be made capable of orientation, in some form or another, on any and every day in the year. And this is the more easy, where, as in Cornwall and in Devon, these circles follow the general rule of the hut rings of the ancient villages, and lie on the southern slopes of the high moorlands.

The reason for this will be evident as we proceed, and with it the reason for the undoubted orientation of such circles as Stonehenge, Stanton, and Arbor. And it may even be that orientation does exist to some extent in the West, and that minor variations may have arisen from precisely the same cause as the discrepancies in the orientation of our older churches, the fact that east was taken from the sunrise at different periods of the year. It is impossible, however, to prove that orientation is an essential feature, as we shall see most plainly when we come to deal with stone rows in connection with circles.

The last feature to be considered, in this connection, is the area of the circles. Are there any inclusions to yield indications of purpose? Here the great majority of the Cornish circles are dumb. The Boscawen-ûn and the Stripple Stones circles, however, contain menhirs; and the Duloe, the remains of a barrow. None of the others give any certain suggestion of contents; and all that can be said further, under this head, is that in most cases the circles are associated, more or less closely, with barrows, cairns, kistvaens, menhirs, and other memorials of a sepulchral character. But there is no further fixed or general rule. It will have been observed that we have only been dealing with existing Cornish circles; some, perhaps many, have disappeared; but the only means of carrying enquiry further, with regard to

them, is to examine such records as the "Antiquities" of Borlase, who certainly records the existence, in his time, of circles wholly unlike any yet in being—to wit, at Botallack. But we need be very cautious. This enthusiastic antiquary, apart from his speculative tendencies, was not always too careful to discriminate between things that differ. It is plain, alike from his drawings and remarks, that he did not distinguish between the hut-ring and the circle proper, or between either and what is called, on Dartmoor, a pound. A circle, to him, was a circle; whether the enclosing stones were contiguous or apart. We need only refer, in proof, to his figure of the Tredinek circle, which he regarded as providing seats or standing places for the chiefs of an assembly. It is simply such a big hut ring as is to be found by the score on Dartmoor, with one of the door-jambs standing. The Senor (Zennor) circle, which (in like manner) he judged to have been a place of election, is but a small cattle-pen. The Kerris Roundago, regarded by him as a place of worship, and as taking its name, probably, from the circlings of the Druids, is a structure of precisely the same type, undoubtedly denominated from its figure. With these warnings before us, we should not be hasty in drawing any conclusions from the plate of the circles at Botallack; which seems to me only too exact in its detail. According to the scale, the diameters vary from five paces to thirty—the use of *paces* instead of *feet* or *yards* does not inspire further confidence,—and only three of the five larger are complete,—viz.: the single example, and two of the supposed intersecting groups. The whole arrangement indeed suggests to me a cluster of enclosures for cattle and the like, with a hut circle or two; very much as may still be found, here and there, on Dartmoor. Since every trace has disappeared, this, of course, is sheer speculation; but I am perfectly sure that the plate cannot be trusted to add to our knowledge of the stone circles of the county.

Let us, now, see what light the kindred antiquities of Dartmoor,—which clearly belong to the same time and race,—can throw on our enquiry.

Stone circles are far more common on Dartmoor than in Cornwall, though, as a rule, smaller. Nevertheless the Forest contains such fine examples as the twin Grey Wethers of 105 and 100 feet diameter; the Scorhill of 90 feet, with one of its

stones standing nearly eight feet high; the Throwleigh of about the same size, with a neighbour of 60; the Raybarrow of 60; the Ringmore of 75; the Fernworthy of 60; the Merivale of 54; the Longstone Moor; and the Sherberton; while there were still larger circles associated with the Drewsteignton Cromlech.

But the most important feature of the stone circles of Dartmoor is the fact of their general, though not universal connection with a very singular class of rude stone monuments, in which, as I have already said, Dartmoor takes the lead. I refer to the "stone rows," so commonly and so absurdly dubbed "avenues" and "parallelitha," and more accurately but quite as pretentiously, "alignments." They were called avenues and parallelitha, clearly enough, because it so happened that, in the first examples to which antiquarian attention was called, the rows were double,—whereas the single row is as common as the double. And while on Dartmoor itself there are as many as seven rows in a group, elsewhere there are as many as twenty-three, which might fairly be called a "labyrinth." Moreover, so far is parallelism from being essential, that rows frequently converge or diverge; and even alignment is put out of court by angles and bends. As yet these rows have not been recognised in Cornwall. Inasmuch, however, as diligent search has largely added within the last two or three years to those known on Dartmoor, it would be rash to say that no Cornish examples exist. There are indeed said to have been "rows" near Kilmarth, but Mr. Lukis saw nothing in the county resembling them, save the "Nine Maidens" near St. Columb, and they, as described by him, bore no likeness to the genuine article. The "spacing" in his plan, however, is much less than in his text; and the possibility must be left open.

At the present moment, thirty-eight stone rows are known on Dartmoor; and, of these, at least twenty-five are associated with circles. The evidence indeed is overwhelming that the Dartmoor stone row, in its complete form, begins with a circle and ends with a menhir, the circle commonly, though not universally, enclosing a barrow or a kistvaen. And these circles, it must be understood, are free-standing, and quite distinct from the supporting stones which are, not infrequently, found to form the outer foundation of a barrow. They are real stone circles.

Rows with circles and menhirs, of what I regard as the typical form, occur:—at Harter, where the circle, enclosing the barrow from which a double row starts, is over 30 feet in diameter, but the menhir is wanting; at Down Tor, where a very fine single row starts from a circle, 37 feet in diameter, enclosing a barrowed kistvean, nineteen stones being standing (out of a probable twenty-six); at Drizzlecombe, where there are three circles enclosing barrows, from 29 to 30 feet in diameter, and one associated with a kistvaen; at Trowlesworthy, where one circle is 20 feet in diameter and the other 23; at Cholwich Town, where the circle is 18 feet across; at Yadsworthy, where the circle has a diameter of 33 feet; at Butterdon; at Launceston or Longstone Moor, where the circle enclosed a barrow and must have been over 30 feet across; near Erme Pound; also at Stalldon, where there is a very fine circle 45 feet in diameter, in which may be seen the traces of a barrow, and which itself was surrounded by a trench. This circle is moreover remarkable as being the starting point of the longest stone row on record, for it is upwards of two and a quarter miles in length, though much ruined towards its further extremity, and wanting the final menhir.

The celebrated rows above Merivale Bridge, which are undoubtedly responsible for the misleading names "avenue" and "parallellithon," vary somewhat from the type. The northern double row begins with a circle surrounding a menhir, so that, save in the matter of size, the Boscawen-ûn arrangement is reproduced. The southern double row terminates with a menhir at each end, but has a twelve-foot circle midway, which once enclosed a kistvaen. The great menhir which stands to the north-west of the rows has the remains of a small circle about it, and attached are the fragments of a row, which I was the first to put on record. Hard by is the great Merivale circle, 54 feet in diameter, at present isolated. Seeing however that almost the entire row belonging to the great menhir has disappeared, probably to build an adjacent wall, and that there is some reason to suppose yet another existed, it would be very unwise to assume that this circle was always as independent as now.

Two other variants are supplied by the rows at Coryndon Ball and Challacombe. At Coryndon Ball a circle, originally about twenty-seven feet in diameter, is the starting point of no

less than seven parallel rows of small stones, one appearing to be the principal and the others accessories. Another single row, close by, starts from a cairn without a circle, a condition of affairs which is exactly paralleled at Harter, where an uncircled cairn heads a single row close by a double. At Challacombe there are at present four rows of stones ending in a menhir, which do not start *from* a circle, but run *by the side* of a circle, some of the stones of which are included in one of the rows.

Finally, we have rows associated with double and triple concentric circles of small diameter. These multiple circles do not appear to be fellowed in Cornwall. The most important triple circle was connected with the rows at Batworthy, which have been described as five in number, but probably formed three only, one beginning with a cromlech, another with a circle enclosing a kistvaen, and the third with the triple ring. When measured by the late Mr. Ormerod, the outer of these circles was twenty-six feet in diameter, the second twenty feet and the third thirteen feet, while three stones stood in the centre.

A similar arrangement is found in connection with the threefold rows at Cosdon, which have a double head, suggesting that what now appears to be one monument is really two. One head consists of a small stone, enclosed by what once were three concentric circles, which is however too small to be called a menhir. The outer circle is about twenty-three feet across, the second twelve, the third is not so clear, all the stones being down, but was not more than six feet in diameter. The other head is a circled kistvaen. Here, the middle circle is the clearest, about fifteen feet in diameter; and there are traces of an inner circle of six feet, and an outer of twenty-two feet. The outer circles of the kist and the standing stone must, when complete, have touched, if they did not actually interfere.

There are traces of double circles—seven and eleven feet, and eight feet and sixteen, and of two single circles, twenty four feet in diameter, with indications of rows, on the plateau of Cocks Tor, but they are very indefinite. It is clear also that a row or rows was connected with the destroyed circles at Drewsteignton.

As to the large circles of Scorhill and Fernworthy, the bearing of the various rows between them is such as to render continuation and connection highly probable. And practically the

only large circles on Dartmoor, concerning which there is no evidence or suggestion of such association, are the Throwleigh, Ringmore, Raybarrow, and Grey Wethers ; and some, of course, may simply have disappeared. It must however be borne in mind that circles are not invariable accompaniments of rows. The cairns which head the rows at Assycombe, Glazecombe, and Conies Down, and the southern row at Harter, have no trace of circles ; and on the other hand, one of the most complete of the smaller circles of Dartmoor, which encloses a very perfect kistvaen, on the hill above Harford, has no indication of a row. And the same is the case with circles enclosing kistvaens at Hound Tor, Bella Ford Tor, Shavercombe, and Grimsgrrove.

To which I may add, that this same association of circles and rows, which has been shown to exist in the great majority of cases on Dartmoor, is seen in such noteworthy examples as Avebury, the grandest of the whole, where the great circle is 1200 feet in diameter ; at Stanton Drew, where the great circle, 368 feet in diameter, and the second of 97, both show remains of rows—though none are now visible in connection with the third ; at Shap ; at Callernish in Lewis ; and at Carnac in Brittany, where one of the three chief groups commences in a circle 290 feet in diameter, a second group with a kind of horse-shoe shaped enclosure, while in the third, where no terminal circle is now found, it is noted that one may have existed. At Shahpore, in India, circles are connected by lines ; and tumuli are linked in the same fashion, in Algeria.

There are other examples, but these will suffice to prove that, from the 1200 feet circle of Avebury, down to the eighteen feet circle of Cholwich Town, there is an intimate connection between stone circles and stone rows ; and that the general purpose of the one cannot be disconnected from the general purpose of the other.

I may add, before going further, that the circles and rows of Dartmoor do not in any way encourage the idea that orientation is an important feature. There is no one certain rule, though in individual localities certain bearings seem more in favour than in others. Thus they have a more general easterly and westerly bearing in the southern quarter ; a more general northerly and southerly bearing in the northern ; while there are

exceptions in both. And we find the same thing elsewhere—Avebury, north-west and south-east, Stanton Drew east and west, Carnac east and west, while at Ashdown in Surrey and in Caithness, the direction is generally north and south. It is impossible to draw any general conclusions from orientations which box the whole compass in this fashion. The most we can say is that certain tribes, or residents in certain localities, had, for some reason or another, their special preferences. Clearly there was no common expression. The Dartmoor kistvaens indeed almost universally lie north and south. There is no evidence of orientation, however, in connection with the greater circles unconnected with rows—such for example as the Grey Wethers, or Threigh. There is a menhir about 8 deg. E. of S. of the Raybarrow circle, but that is a boundary stone and may be comparatively modern.

Now, whatever the precise meaning and intention of the stone rows may be—which we will not discuss at present—it is clear that their nature is funereal. Wherever they are found all their identifiable associations are sepulchral—cairns, barrows, kistvaens, cromlechs, and, I will add, menhirs. It is impossible to exclude the circles from the category. The wild idea of Mr. Fergusson that the rows represent battle plans, would only apply, if at all, in the case of double rows, and is utterly irreconcilable, even on the vaguest hypothesis, with by far the greater number of instances. Real enemies must have been utterly absent in most instances, and the event depicted an idle parade. It is, in short, purely a flight of the fancy, like the druidical assumptions of the antiquaries of the elder school.

The circles thus fall into place, as part of one great series. In the majority of cases indeed their sepulchral character is quite evident. They enclose barrows, cairns, kistvaens, cromlechs, menhirs; while, not infrequently, interments have been found where no surface indications of them were visible. Now this is fully admitted with regard to the smaller circles. It is the larger that have been dubbed “sacred,” and so regarded as mysterious, simply because they *are* larger. Yet the largest known, that of Avebury, has stone rows attached, and can be none other than sepulchral. And, in the foot-by-foot gradation of these monuments, from the very smallest, whose sepulchral character no

one doubts, up to the limits where a leap is made to Stanton, and Stonehenge, and Avebury, who will be bold enough to say where the sepulchral circles end, and the sacred begin? Or, to press the point still closer,—who will supply reasons for the differentiation; where is the line to be drawn?

It is perfectly true, as we have seen, that we find circles without rows, and rows without circles—such variations as are common in modern graveyards—and we cannot be always sure that one or the other has disappeared. But it is plain that the presence of the row is distinctive—that it indicates not merely an interment but a special interment; very possibly, as I have suggested elsewhere, that of the head of a tribe or family, the number or importance of which the length of the row might be held to express—representing in Highland phrase, “the chieftain and his tail.” Adding a stone to a row is only another phase of the idea involved in adding a stone to a cairn. And I have also hinted that this peculiar class of memorial may have some connection with the wide-spread cult of the powers of Nature, which the association of menhir and circle indeed seems specially to indicate. But of this there is no evidence.

Of all the hypotheses touching the purposes for which the larger circles were designed, that of their occupation for assembled worship is, curiously enough, absolutely the one for which there is the least evidence. It is indeed purely the product of antiquarian imagination. As we have seen, it is impossible to draw any line where the accepted sepulchral circle is to end and the sacred circle to begin. Moreover, far too much stress has been laid upon mere negation. It is probably quite safe to assert that while there are many cases in which the larger circles have been found to contain remains—at Crichtie in Scotland burials were noted at the foot of each stone, and occasionally there have been groups of kistvaens,—no circle from which they are presumed to be absent has been so absolutely explored as to show, beyond doubt, that they did not exist. And, beyond this, a feature absolutely fatal to the idea that a large circle must necessarily be intended for worship, is their frequent contiguity—as at the Hurlers and Grey Wethers. Mr. Lukis was not a whit too severe on this inferential suggestion of rival congregations. The grouping of graves and sepulchral memorials is a thing we all understand.

But this, of course, does not exclude the presence or the indication of religious sentiment. The less complete orientation of the circles, the more complete of the kistvaens and rows, do show some traces of a solar cult, though variously expressed, but these traces in my view are purely incidental to and dependent upon the rites of sepulture, and the current belief in the hereafter of the dead. That they led in certain cases to offerings to the manes of the deceased, and to various forms of ancestor worship in connection with circles and cromlechs and menhirs, was not merely natural but inevitable. We have no absolute proof of the existence of such practices in this county, though it seems to be hinted.

The position of the circles and such traces of orientation as they may be held to exhibit, is then easily explained. In being found on the southern slopes of hills, rather than on the northern, they simply follow the local rule for habitations. The hut circles so numerous yet on Dartmoor, always, so far as may be, have a southern exposure; and the same is the case in Cornwall. And the position of interments is always fixed by rule, although the rule varies. Aspects referring to the rising or the setting sun are the most numerous; but northerly and southerly directions are equally significant in their intention. The practice in either was in some sort, at first, the expression of a creed. But no doubt in time it hardened into unmeaning custom—just such a custom as makes us dig our graves east and west, in deference to the sun-worshipping instincts of our far-back ancestors.

And we may apply precisely the same analogy to the suggestion that Stonehenge, at any rate, was a temple of sun worship. In the course of ages our churches and our graveyards have become intimately connected, which from the beginning were not so; and the orientation of our churches is as clear a survival of the solar cult as the orientation of our graves. But the fact is not usually recognised; and if any attempt is made to account for the practice, it is generally upon the lines indicated in the tradition that the "Hurlers" were men transformed into stone for hurling on Sunday; the "Merry Maidens," in turn, petrified dancers; or Stonehenge itself the dance of giants; or Stanton Drew a wedding party. Or again, as the story in the Welsh triads, that the Boscawen-ûn circle was one of the Gorsedd

or judging-places of poetry. The whole value of such statements or legends lies in the fact, that they prove the first intention of the thing to which they relate, to have been forgotten.

Nor should we hesitate, if need be, to draw the same conclusion with regard to customs. It may very well have been that it was a Scandinavian practice to hold courts and assemblies at or near some of the larger circles, but it does not follow they were built for the purpose. Because a structure is used in a certain way it would be most unwise to contend such purpose to have been original. It is almost inevitable that places to which importance has once attached, or which are distinguished by special peculiarities, or which have a halo of mystery, should retain a prominence or use of some sort. When, however, we enquire what uses circles may be put to, in the present day, the answers are far too divergent to be conclusive of original intention. Thus the Kurds in Eastern India are said to "use circles in connection with the worship of the rising sun, the tallest member of the circle being towards the east. The worshipper perambulates the circle, with the sun, and sprinkles the stones with the blood of a cock." So, in Western India, circles occur with a central stone to which a cock is sacrificed. Again we are rightly told it is a common thing, where there is an external menhir or group, that "the external pointer bears generally a male name, while the circle is female," as in the "Merry Maidens" and the "Pipers" at Bolleit. This would, however, direct us to Phallicism. So with the custom of the modern Arab, who surrounds the grave of a man of noted sanctity with a circle of stones, and places on one side (almost invariably on the west) a little dolmen altar about three feet high, consisting of two stones supporting a third laid flat on the top. Whenever he visits the spot he kisses the stone and invokes the dead man's aid, placing his forehead on the altar, and then depositing a gift.* Traditions and customs like these, so wholly inconsistent, prove original intention to be lost. And what is most remarkable, with regard to the last mentioned, is this:—Capt. Conder figures one of these Arab circles near

*Vide Conder's *Heth and Moab*, pp. 218, 219, 327. Capt. Conder suggests that the circles with adjacent menhirs served the purpose of rude calendars, marking the changes of the seasons by indicating the course of the sun. But surely there was no need of such device as this. The idea is pure hypothesis and moreover inconsistent with the general conditions.

Heshbon; and it turns out to be simply a hut circle, such as abound on Dartmoor, the dolmen being the two jambs and lintel of the doorway. This Arab teaching, then, is quite worthless and misleading.

We may apply precisely the same line of argument to the case of Stonehenge. No doubt there seems very remarkable exactness in the orientation of that monument. But Stonehenge by its construction is one of the latest of its class. When it was built, circle-building must have lasted long enough to give the opportunity for its original meaning to have been obscured, if not lost—just as in the case of the orientation of our graves and churches. That it is however quite possible for the greatest exactitude of astronomical design to be combined with a purpose purely sepulchral,—Professor Piazza Smyth and his followers notwithstanding,—the great pyramid attests. I see evidence too, of the same sort of purposeless survival in the central groups of stones, which have been called “coves,” at Avebury, Stonehenge, Stanton, Arbor, and elsewhere. They answer precisely the same end as the enclosed menhir at Boscawen and Stripples Stones, and are nothing more than a ceremonial reproduction of the cromlech, in its turn originally a greater kistvaen—the first purpose having been, as I have said, if not lost at least obscured. Hence, no doubt, a few cases in which the circle seems to be used as a mere accessory, to enhance the importance of a menhir or other rude stone memorial.

There surely should be nothing to surprise us in this. For how many centuries have we not been putting utterly meaningless urns in our churches and churchyards?—though certainly the growth of cremation seems likely to give them a turn of utility and common sense again. And, indeed, the past lives in the present most completely in our sepulchral memorials. What is the modern headstone but the ancient menhir; the grave mound but the cairn or the barrow; the altar tomb but the kistvaen? Nay, the cromlech is at times closely reproduced, as for example in such churchyards as those of Bolton Abbey and sundry of its neighbours, where a favourite form of monument is a slab of stone free-standing on supports with open space below, the structural cromlech or dolmen idea being in every point complete.

It may be granted that the stone row is not very closely represented, unless the not infrequent head and foot stone be pressed into service ; but the vault is simply a modern form of the chambered cairn.

Moreover, if we do not find stone circles, we find what is, at least, the representation of the chief idea which, to my mind, they embodied,—in the boundary stones and rails by which certain plots are enclosed. For, however the practice originated, this at least seems to be clear, that the circle is intended to suggest a ceremonial separation—a dedication—if you will, of the spot enclosed to a special use, which, in connection with the respect paid to the remains of the dead, and the development of animism, would inevitably, in the course of time, come to have something sacred about it—a belief which would no doubt grow. The association of any spot with the rites of burial, and its separation from the ordinary uses of land around, could not fail to mark a stage in the development of primitive religion.

This idea of separation and dedication is akin to the “taboo” of the New Zealanders ; to the feeling which prompted Moses to set up bounds at Mount Sinai ; and which we see in another form in connection with the association of circles with the magical acts of the Middle Ages. There is no genuine physical separation in either case, only a ceremonial suggestion, which itself is enough to indicate some advance in religious feeling or superstition—some respect for, or dread of, the spirit world. The barrier raised is mental or moral. The appeal is to the feelings, not to physical obstruction,—to fear, it may be, but not to force. And here again we find precisely the same motives at work in the present day, and in what is called civilised society.

And a point which I regard as of the very highest importance, and which I have never yet seen dwelt upon, is this. We find these stone circles in constant association with hut circles—the skeleton circle which suggests the abode of the dead with the complete circle which formed the abode of the living.

Here, too, we have the analogue, and the survival, in the existence of the mausoleum,—carried to such an extent at Père-la-chaise, for example, that the main avenue is like a street of diminutive dwellings ;—and so persistent in the East, that hundreds of tombs, of the forgotten dead, form the very sufficient

abodes of the living. Another link in the chain is the fact that the common mode of interment in the kistvaen, so generally associated with the circle, is that contracted form which recalls the position of repose, and forcibly illustrates the line—

“Our little life is rounded with a sleep.”

The larger circles are of course far larger than any hut circle; but this might naturally arise from either of two causes:—the desire to lend importance to the interment; or, what we know must have been the case in many instances, the reproduction of a large enclosure which encircled a group of hut circles, probably connected by the family tie. This view is sustained by the fact that several of these large circles have been found to contain groups of interments. And while the non-discovery of interments in all cases is no proof that none exist, or have existed, some allowance must be made for the vast length of time over which circle building extended, which must have carried with it some variations in method; while it seems to be absolutely clear that in certain of these rude monuments—again paralleled in modern days—the work of construction was never completed. There are rows that appear quite conclusive on this head.

I have stated that the practice of erecting these circles extended over a vast length of time. This is easy of proof. The worked stones of the outer circle at Stonehenge, are as plainly indicative of more recent date, as the unworked “foreign stones” of the inner circle are of earlier. Some of the barrows near Stonehenge are undoubtedly of the Bronze Age; but it by no means follows that metal tools must have been used in dressing the great trilithons and their imposts. The fact that fragments of both the “native” and the “foreign” stones have been found in a few of these barrows proves that the stones were on the spot—in other words that Stonehenge, as we see it, was erected—before these barrows were formed. The suggestion has been made that the presence of the “foreign” stones, which may have come from the Channel Islands, or Wales, or in part from Cornwall and Devon, shows that Stonehenge must be a temple. Their presence certainly indicates the importance of the structure; but is the practice of bringing “foreign” stones, to lend additional distinction or dignity to a sepulchral monument, quite unknown even now?

Geoffrey of Monmouth says that Stonehenge was raised by Aurelius Ambrosius, A.D. 490, to the memory of a number of British chiefs killed by the Saxons, on the suggestion and by the help of Merlin—the sole value of which statement consists in the recognition of a sepulchral character, and is very small. The attempt has been made to sustain this idea, specially as to the date, by the character of the orientation. But that is a most uncertain foundation for any hypothesis. The present-day fact is this—that if any one looks from the so-called “altar stone” in the circle towards a tall exterior menhir called the Friar’s Heel on the 21st of June, he will see, weather permitting, the sun rise exactly behind that stone. But that this present-day fact is a proof of original intention depends, for one thing, upon the so-called altar stone—which is broken—occupying its original position; whereas Aubrey expressly states that “an altar stone found in the middle of the area” had been carried away. It depends, for another, on the original position of the big stone immediately outside the outer circle, which is known as the “slaughtering stone.” When this was upright, if the present site is the correct one, it blocked the view of the Friar’s Heel from the “altar stone” altogether. The only certain evidence of date, therefore, (in my opinion), that Stonehenge affords, is that it was erected before or during the Bronze Age, and this of itself is sufficient to dispose of the Aurelian-Ambrosian myth, which would refer it to the days of Iron.

But Devon, if not Cornwall, yields evidence of far higher value, and shows us that we are much more likely to err in bringing down the date of these memorials than in carrying them back. There is on Dartmoor ample proof, in more than one locality, that the stone rows and the hut circles are generally, if not wholly contemporaneous, while, as we have seen, the rows are clearly coeval with the circles. Now during the past two years, several exhaustive investigations have been made into the hut circles of Dartmoor, chiefly by the Rev. S. Baring-Gould, and by Mr. Robert Burnard; while in the present year an equally exhaustive examination has been made of Grimspound, in which I have had the pleasure of participating. And while refraining from going into details fully set forth by our Committee elsewhere, I may say at once that, without exception, these hut circles were

found to have been the dwellings of a Neolithic people, and apparently in a very simple and early stage, using only flint implements and possessing no knowledge of pottery. The conclusion follows that the stone circles, equally of Cornwall and Devon, are older, and probably far older, than our local Bronze period. What the date of the commencement of our Bronze period may be, I may not now stay to enquire. I will for the moment content myself by quoting what I wrote and published twenty years since, and have never yet been called upon to defend—namely, that the geological evidence offered by the ancient stream works at Carnon and Pentuan antedates the commencement of tin mining, and consequently our Bronze Age, to a time when the mammoth either still existed in the West of England or had not long disappeared; and when the general level of Cornwall and Devon was at least thirty feet higher than now. The conditions of our raised beaches and submerged forests show that the change or changes of level involved must have been very slow and gradual (Sir C. Lyell's estimate of the rate of crust motion was $2\frac{1}{2}$ feet in a century) and we have direct evidence that these changes had all ceased before the historic era. The further we put back the commencement of our local Bronze Age (for the Bronze Periods of different localities by no means necessarily synchronise) the further back must we put the greater number, if not the whole, of our stone circles!

This high antiquity also disproves the suggestion that they can have had anything to do with the Keltic races. Indeed it is quite evident, from the names the Kelts gave these monuments, that they were ignorant of their origin and purpose—as ignorant indeed as the Saxons who read the simple descriptive *mên* into “man,” or its plural into “maidens.” In this connection, too, it is worthy of note that Capt. Conder was led by his explorations in Heth and Moab to suggest that in the dolmens, menhirs, circles and other rude stone monuments “we find the remaining works of an ancient stock preceding both Aryan and Semitic races, and belonging to the illiterate and consequently prehistoric ages of the use of bronze and flint.”* The results of the explorations of the Grimspound Exploration Committee on Dartmoor have

**Heth and Moab*, p. 196.

proved that this suggestion is in the main correct, and that the Rude Stone Monuments of Cornwall and Devon were reared by a race which preceded both Kelts and Saxons, and in an early stage of the Neolithic period. No existing ideas touching these monuments—certainly here, probably elsewhere,—can, then, be provably traced, in legend or in custom, to their authors.

[*To be continued*].

NOTES ON DULOE CIRCULAR ENCLOSURE.

(By Rev. W. IAGO, B.A., Co-Editor R.I.C.J., and a Past-President).

In considering the character of the enclosure known as Duloe circle, which is so very much smaller than the other stone circles of Cornwall, it becomes specially necessary to study, in the first place, the name of the locality—which may have reference to the neighbouring water, or to a barrow, or to superstitious fear.

The Parish of Duloe does not appear to be so called from its Patron Saint, for the Church is dedicated to St. Cuby or Keby; Tonkin, however, has conjectured, that there may have been a dedication (now obsolete) to St. Teilo,—whence the name of Dulo;—and St. Dilic, named as “one of the supposed 24 Welsh Missionaries,” has also been quoted (see Borlase’s “Age of the Saints,” pp. 136, 149); but corroboration is lacking.

Hals had suggested that Du-lo might signify “God’s lake, or water,” *i.e.* the Looe river; and it is a fact that the Looe river bounds the parish and descends to the sea between the east and west towns also named Looe, and further south, flows into Looe Bay, in which is situate Looe Island.

Tonkin, in quoting Hals, preferred to consider that the name signified not “God’s-lake,” but “Black-lake” (du-lo = Celtic for “black-pool”), which he, too, explained as the pool of the Looe river, to be seen when the tide is up between the towns. Why the estuary should be called “black” is not very apparent. Others, as shewn in Bannister’s Glossary, have derived the name from *dehou-lo*, “south-pool;” &c.

Polsue is even more definite in his statement concerning the rivers. He has written (see Lake’s History of Cornwall, vol. I, p. 309),—“The river Dulo, or Black Loo, rises in the parish of St. Pinnock, and, coasting in a southerly direction, becomes navigable at Trelawn Weir, about two miles from the sea. A mile further on, it joins the Looe from St. Cleer, and they both pass into Looe Creek:—The whole course of the Dulo being about seven miles.” Another “Loo Pool” is near Helston.

Whether the country parish of Duloe takes its name from the water or not, the harbour and towns of Looe seem to do so; for all are agreed that Lo, Loo, Looe, Lough, Loch, Lake, are synonymous, and the waters of the sea and rivers meet in the land-locked estuary there, and spread out in lake-fashion.*

But, further, we may observe that if the latter part of the name of the Parish be taken from the name of the Looe, the prefix may also refer to the same, without meaning either "black" or "Divine," for "Dour" in Cornish signifies "water" or river. Accordingly, in the old Cornish Manuscripts we find the expressions:—"dour cedron"; "dour tyber";—for "brook-Cedron"; "river-Tiber." Similarly, "dour looe" (shortened to Du-loe) would stand for water-looe, the stream of the Looe, "Looe river," Tidal-lake river.

And moreover it is to be noted that if the Cornish adjective du, or dhu, for black, were part of the compound name of the parish, it would probably stand at the end, instead of the beginning, of the word; as in the names Pol-dhu, black-pond, or mud-pool; Bal-dhu, black mine-work, or hill; &c. (See also Dr. Jago's Cornish Dictionary, p. 18;—Moran-dhiu, blackberry; Mola-dhiu, blackbird, &c.)

There are, however, other explanations of Du, possible. Dun, downe, dune, is a hill, therefore Looe-rise,—the land above the Pool—as well as various different combinations, might also be suggested. Again, Dew (or Dui) in Cornish signifies two, a pair, a couple; the name Dew-loe might therefore perhaps be given to a district to a great extent embraced, as this parish is, by the two branches of Looe rivers. Moreover, Diwedh, Duadh,

* Williams, in his Cornish Lexicon, gives "Lo, an inlet of water, a pool, a pond;—preserved in the local names, Looe, and Duloe:—black-pool." He quotes, as cognate terms, the Greek, lakkos; Latin, lacus; Welsh, llwch; Armoric, louch; Irish and Gaelic, loch; Manx, logh."

With regard to the double term, Loo-pool (applied to more than one such inlet), the expression appears to be a reduplication,—the Cornish title linked with the English for translation,—Loo-pool standing for "Loo—otherwise Pool." Similar instances of reduplication are known, *e.g.*, Bray-hill, "Brea—otherwise hill;" Dinas-castle, "Dinas—otherwise Castle;" Castle-an-Dinas, "Castle—otherwise the Dinas, or hill-camp."

And whereas Lo, in Celtic, or old Cornish, means a flowing-pool, or tidal-lake,—so Pol signifies a stagnant pool or pond, a water-pit or well,

&c., stands for last, end, limit, or boundary,—whence perhaps Dewedh-looe, the region extending as far as the Looe, or bounded by it. Dué (participle) signifies “ended;” Due, “will come,” is the future of the verb dos; whilst Duello, dello, dyllo, is the verb meaning to let out, or discharge. And from Du, or tu, a side part or place, we might have Du-loe, the Looe-region, the land on the side or bank of the Looe.

But all this assumes an extensive parish being called by the name of its bounding water, and if it does in any way obtain its name from the two rivers, or from the estuary below, the term Duloe does not suggest anything which can throw light on the origin of the Stone Circle. I would then point out that, in Anglo-Saxon (which language crept into some parts of East Cornwall,—displacing the Celtic), Du-low may have signified “Black-barrow,” or dark tumulus. (Dun=black, brown, dark;—hlæw, hlaw, low,=a covering, a grave, heap, barrow, mound, small hill, a low or loe). The term “low” or “loe” is extensively applied to barrows in other parts of England, and the name “Black-barrow” is met with at certain places in Cornwall. Near Bodmin is Black-Pool, at “Dun-mere.”*

Jewitt, (in his “Grave-mounds,” p. 4) has stated:—“In Derbyshire and Staffordshire the term ‘low’ is so very usual that, wherever met with, it may be taken as a sure indication of a barrow now existing or having once existed on the spot.” He adds that there are more than 300 lows in Derbyshire and on its borders, and he names as examples:—Arbor-low, “Dow-low” &c.

This latter name reminds us of Duloe, and we might also compare it with Dunlo. For another comparison and contrast we may note Dowland, by Dolton, in Devon; the former place being mentioned as Duelonde, in the Episcopal Register at Exeter, A.D. 1269.

If Duloe, then, should take its title from its “low” or “barrow,” we have the character of this small circle revealed in

* Here again other derivations occur to interfere with so probable a coincidence in terms; for on the hill, above Black-Pool, is a large British circular Camp, in Dun-Mear Wood, and Din or Dun, is Cornish for hill-fortress; and Meor, meur, mawr, is great. The Lexicographer Williams explains Dun-mear simply as the great hill; and certainly the steepness of the old roads leading to and from Dunmere Bridge is proverbial.

the name, and it may be regarded as the enclosing stones of a burial place, the internal mound of which has perhaps been removed for purposes of agriculture. A distinct example of such removal is traceable at Pawton, in St. Breoke, where a kist, now called Druid's Altar, has been laid bare, and appears like a cromlech on the ruins of a mound. It is to be observed, however, that if the Duloe stones did bind the base of a barrow they are not contiguous. They may have merely surrounded it.

Polsue has noticed Duloe stone-enclosure, thus:—"Near Stonetown, about a furlong to the north-east of the church, stands a small Druidical circle, about 15 feet in diameter; composed of 6 or 8 stones of quartz or spar, one of which is about 9 feet high. Some of the stones lay on the ground, and in 1863 an attempt was made to fix them upright. Under one of them was found a cinerary urn, which was completely broken and its contents scattered. One of the stones was also broken. The adjoining hamlet is called Stonetown, from these memorials, and their position is about 440 feet above the sea level." (Polsue has here given the diameter inaccurately, evidently by quoting from McLauchlan).

A plan of this small circle is given in Lukis's *Prehistoric Monuments of Cornwall* (plate xiii), and the following description of it is inserted at page 4 of the same work:—

"This is a remarkable monument, on account of the great size of its stones. It is situated in a grass-field, close to the village of Duloe, and is 36 feet 6 inches in diameter. Seven stones are erect and one is prostrate. They are placed at distances of from 8 to 12 feet apart, and are all blocks of quartz; the highest stone is 8 feet 8 inches high*, and 7 feet 6 inches in greatest width. The lowest is three feet. The fallen stone, the largest of the circle, has been artificially split into two parts, and is partially buried in a pit, which appears to have been excavated when it was thrown down for the purpose of converting it into building materials or gate-posts. The ground on which the monument stands is level. The monument is so small and differs so much in character from all the other circles, that it is probably the enclosing ring of a cairn which has been entirely removed."

* That is, above ground.

The Rev. Canon Bush, Rector of Duloe, at the request of the writer, has kindly supplied the following independent account:—

“D[h]ulo is understood to mean either God’s, or black, water. No doubt Looe and loe are the same word. In Camden’s map, Looe is spelt Low, but Loo-poole is mentioned. I suppose that Lough and Loch are really the same words.”

“The name of the farm on which the Duloe Circle stands is Stonetown. It is about 150 yards north of the Church, and slightly oval; $36\frac{1}{2}$ by $33\frac{1}{2}$ feet, being the inner measurement.”

“25 years ago, there was a hedge directly through the circle,—some of the stones forming a part of the hedge,—and when I represented this to the late Rev. T. A. Bewes, the owner of the property, he had the hedge removed, when it was found that those who made the hedge had thrown one of the stones, no doubt to facilitate their operations.”

“In removing the hedge a small earthenware vessel” [like a vase, or wide-mouthed urn, in shape] “about 4 or 5 inches in length, was discovered, but on being exposed to the air it crumbled. The fragments were sent to Mr. Bewes.”

“The stones, including the recumbent one, are 8 in number, and vary in height from 4 to 10 feet. The highest stone is at the E.S.E. point of the circle.”

But here, we would offer a still bolder guess at the derivation of the name of “Duloe”;—a less complex explanation, perhaps, than any yet hazarded, because, in this case, the word is simply Cornish, and not compounded of incongruous elements.

We have seen that the name of the Deity, and the title black, are of doubtful suitability to the locality; and that the term loe, for tumulus, is scarcely known, if at all, in Cornwall; whilst a river rarely names, except at ford or mouth, a district of land extending to, or away from, the water.

We know that mysterious stones (in various places) standing erect, poised, or lying prostrate, and also that great earthworks, mounds and trenches,—the original purposes of which have been lost in obscurity,—have been regarded, in all ages, with veneration; and, often, with dread. They have been associated with ideas of prevalent customs, familiar objects, or of the supernatural;

and have received names accordingly. The Giants' Dance, the Devil's Dyke, the Hurlers, Pipers, Merry-maidens, the Grey-wethers, Druid's Altar, the Giant's Hedge, Tom-Devil stile, the Devil's Whetstone, Arthur's Coit, &c., are terms which immediately occur to us in such connexion.

We may yet, then, find in the name of Duloe circle some fanciful description of a similar kind.

The stones are mystically placed; they present a sombre aspect,—venerable and grim! They are awe-inspiring, to beholders, by day; and doubtless have been objects of terror, to the lonely wanderer, by night.

Perhaps, in olden times, the dwellers around regarded the Stonetown circle as "Demons" or "Devils," standing in a ring: that is, looked upon the stones as "buccas," "bugbears," "bogies," "hobgoblins," "fiends," or "diaboloï."

In old Cornish, the very term to express this idea was "*Dewolow*" (*Duloe*?)!—the word for Devil or fiend being *Deawl*, *diawl*; *Jawl* or *jowl*; which became, in the plural, *Dewolow*, *dywolow*, *dewlугy*, or *Jowlow*,—devils, fiends:—derived, of course, like the English word* from the Greek and Latin.

Williams, in his *Cornu-Britannic Lexicon*, has quoted, amongst other lines illustrating this word, the following sentences from the old Cornish manuscripts "*Origo Mundi*" and "*Resurrectio Domini*":—

- { Devils without number, always grinning at thee!
- { *Dewolow* hep nyver pûp ûr orthys ow skrynkyé!
- { Ye princes of the devils, immediately open the gates!
- { Why pryncys an *Dewolow*, scon egeurech an porthow!

We can refer to an instance in another part of Cornwall, in which a stone gave name,—through the Cornish designation it had acquired,—to a surrounding region. The Romano-British

* The Greek verb *Diaballo* (*διαβάλλω*),—compounded of *dia*, &c.,—has the meaning "traduce, falsify, deceive, mislead;" whence *diabolos* (*διάβολος*), slanderer, deceiver, the devil; Latin, *diabolus*; Spanish, *diablo*; Italian, *diavolo*; Cornish and Welsh, *diavol*, *diafol*, &c. (Cornish plural, *dewolow*, &c.); Armoric, *diaoul*; Irish, *diabhal* (pronounced *diowl*); Gaelic, *diabhol*; Scottish, *deil*; French, *diable*; Anglo-Saxon, *deofol* or *deoff*: English, *devil*.

Some etymologists derive the Cornish personal or family name *Joll* or *Jewell* from *Deawl* or *Jowl*, devil.

Christian Monument of Rialobran, in West Cornwall, being lettered (but not decipherable by the illiterate)—was simply called, in Cornish, “Maen-scryffis,” the “Stone-inscribed.” From this, the Down on which it stands has been named “Gun-mên-scryfa,” Inscribed-stone Down; (goon, a down).

Similarly, it may have been that the prehistoric small Circle of stones in East Cornwall was known as “the diabolical Goblins,” and gave name to the district about it,—(on the banks of the waters of Looe),—the neighbourhood of “the Devil-stones.”

If this surmise be correct, the venerable Church and the Parish of Duloe derived their common name from those more antique sepulchral-monoliths, which (being regarded as evil spirits, turned to stone) awoke the superstitious awe of those who lived long before Christianity and the name of St. Keby, and the English language, were known in that spot, called, in modern parlance, “Stonetown.”

But this is not urged as a conclusion; and we would prefer to sum up, for and against these various surmises, thus:—

1. The name of the Deity (Du or Dew, like Deus, God; plural duow, dewyow, gods) seems to have been in no way connected with the locality.
2. The adjective for Black (du, dhiu) is, as a rule, placed after the noun which it describes; as in cronek-du, a black toad, and in pol-dhu, mud-pool; as already stated. We must therefore doubt the presence of it in Du-loe.
3. Again, as (dun, and low or loe) the Anglo-Saxon terms for black or dark, and for tumulus, scarcely (if ever) occur in Cornwall, they too must be regarded as rather improbable components of the name.
4. And since the descriptive title of the district is not found to have ever been pronounced as Dru-lo, Dun-lo, Din-lo, or Dour-lo we may perhaps discard, with the foregoing, such derivations as Druid, hill, fort, and brook, would give us.
5. There is moreover no real evidence that any Saint, such as Teilo or Dilic, ever gave name to the place.

So far for rejections;—now for possibilities.

6. There is no doubt that the term Lo, Loo, or Looe, is applied to the waters of two rivers and the tidal pool which, being united, form most of the eastern, western, and all the southern boundaries of this parish.
7. As far as we have been able to discover, the only features or objects from which the district could have obtained its name of Duloe in ancient times, must either have been its boundary Waters, or its prehistoric circle of sepulchral Stones.
8. These Stones, as we have shewn, may have excited feelings of superstitious dread, their purpose having been forgotten, and they may have been regarded as a supernatural work, perhaps as a magical changing of demons into stone, and if called "devils,"—Dewolow,—the country around may have acquired that name as the Dewlow district, the region of the Devils' Ring.
9. But if the Looe Water instead of the Stone Circle, gave name to the land, we must seek a really probable solution of Du as a prefix. Only a few such now remain to us, and these are the following:—Dehou, south; Dew, two; Du, a neighbouring region.
10. "Dehou-lo," "South-pool" has nothing to commend it to acceptance, except that the tidal-lake is at the southern extremity of the Parish.
11. Since Dew (masc.) or Dui (fem.), signifies two, a pair, a couple, and Lo, running lake-water, is masculine, Dew-loe would signify the double-branched lake, or the twin rivers forming it, viz.: the land of the two-streamed Lake, or the Two-loes.

This prefix Dew, the sign of the dual number, is of frequent occurrence in Cornish, *e.g.*—dew-vrêch, the two arms; dui-lof, the two hands; dui-vron, the breasts; dui-glun, a pair of reins.

If it be objected that the eastern of the two bounding rivers is called the Looe, whilst the western only is the Du-loe, we must observe that much of this latter lies within the parish of Duloe, therefore whilst the Looe-river, (Pool-river), takes name from its

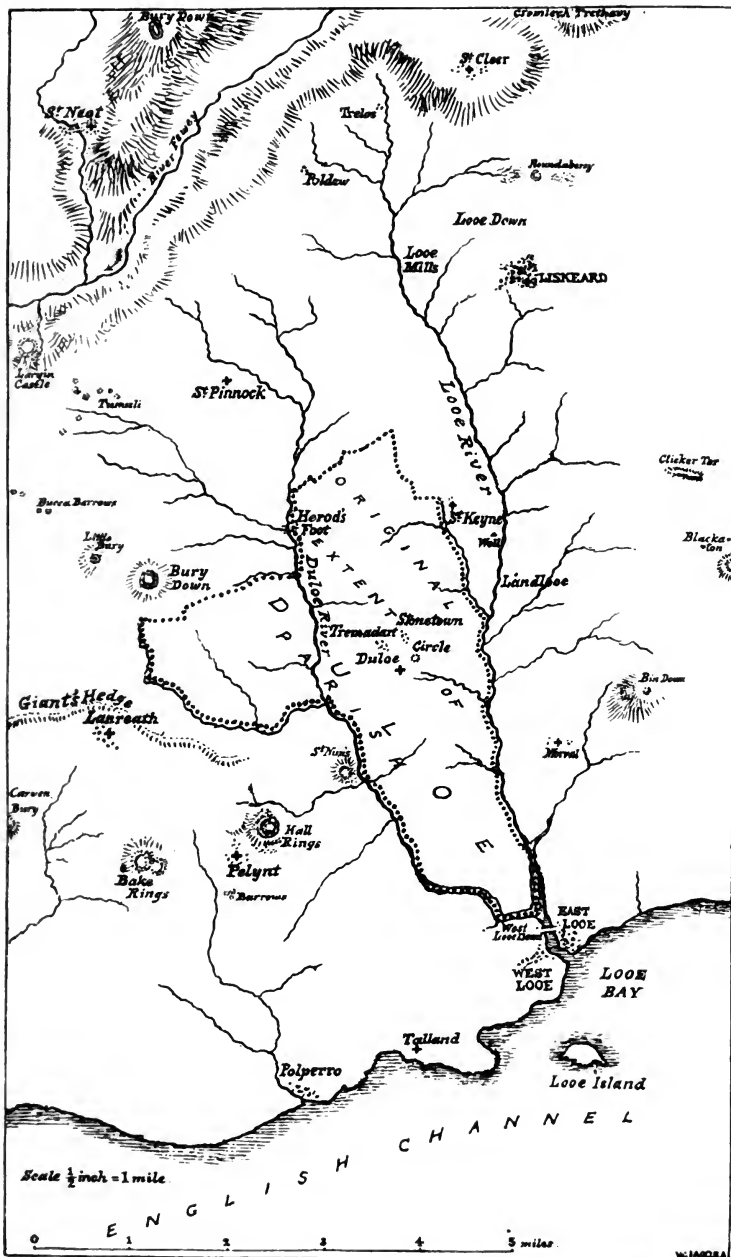
connection with the tidal lake which it helps to form, the Duloe-river, may be called after the district or parish across and by which it runs, or else its name may mean "Looe-river, number-two." Moreover, not far from its sources are places designated by such names as signify twin-woods, &c., commencing with Du, or Dou.

12. But it seems absurd for a tract of dry land to be called river, rivers, or pool,*—whether Divine, black, south, or double!—common sense demanding that we should find, in at least one portion of its name, some recognition of it as *terra-firma*,—and this the prefix, Du, does yet afford:—

Du or Tu, in Cornish, is "a side, a neighbouring part or place" (as we noted before), and this is perhaps the best derivative of any we have considered. It enables us,—without any flights of fancy after Deities, demons, blackness, hill, or tumuli,—to regard Du-loe as signifying merely "Looe-side;" Looe-land; the country abutting on the lake; the shore of the Looe; the region extending towards the Pool and towns called Looe.

Du, as a "part adjacent," suggests that which is "juxta" to some particular spot. Elsewhere in Cornwall we have "Lanteglos-juxta-Camelford" and "Lanteglos-juxta-Fowey;" the one signifying the church-enclosure near the ford of the river Camel, or near the town named from it Camelford; the other, the church-enclosure near the river Fowey, or the town, or parish, so called. Similarly Du-loe, in Cornish, will stand for "fines-juxta-lacum," "partes-prope-amnes," "regio-juxta-Looe,"—the land or banks of the tidal lake and its rivers; or, the Looe-neighbourhood, the region near, or over against, Looe. According to this same interpretation Looe-river means Pool-river; and Duloe river, the river of Pool-side,—the river that flows within, as well as bounds, the parish named Duloe.

* Notwithstanding this, there are Blackpool and Blackburn, in Lancashire; Blackawton, in Devon; Blackwater, in Hants; Blackwell, in Derbyshire; sundry Blackfords, &c.; and Pool, in Cornwall and elsewhere.



PLAN OF DU-LOE,=LOOE-SIDE,=THE REGION-BY-THE LOOE,
OR, TOWARDS-LOOE.

With this simple explanation, then, of the name of the Duloe region,—shewing that most likely, after all, it did not originate in connection with the rugged ring of Stonetown (known amongst Archæologists as the Duloe Circle), but is descriptive of the situation of the district itself, the tract of country by the running water, adjoining the tidal pool, near the towns of Looe,—we conclude our investigation of the general name of the locality.

The Duloe Circle and its neighbouring structures were mapped and described by Mr. McLauchlan, in 1845; (see R.I.C. Report, 1846, pages 1—19, “Giant’s Hedge,” &c.); the circle being shewn as 260 yards N.E. of the Church, with 6 of its 8 stones standing. He fancied that the fallen stones exhibited the “overthrow of Baal’s altar,” in this “High-place,”—440 feet above the sea-level. He noted the prevalence of oak and vervain, near, and imagined that the circle was Druidical. The mound he regarded as named from the Saxon loe, and the district (from it) Dru-lo, or Du-lo,—Druids’ Hill or Tumulus. All this is more or less unlikely.

Stone-Town, likewise, he held to be called after the Circle-stones, whilst Tremodart, close by, he also deemed, perhaps rightly, to have been named, from the same relics, “Tremoderuy”—“the Place of the Ring.” Here was the Domesday manor Tremodret.

He rejected Hals’s and Tonkin’s suggestions of Du, God’s or black; lo, river, lake, or water; and added:—“The real name of the “Duloe river is Shallow-pool river, and I could not hear, from any of the old people, any confirmation of the name Duloe or Black river, given by Martyn in his County Map,”—[and quoted, from Martyn, in Wallis’s List].

McLauchlan’s view as to “ring” has the authority of the Cornish Glossary, which gives “Moderuy,=armilla; and of Williams’s Lexicon, “Modereuy,=bracelet,” from Mod, thumb; and ruy, ring. As an armlet Moderuy meant, perhaps, a ring of about a thumb-breadth, or thickness.

Mr. Borlase, in his “Nænia” has described Duloe Circle, and favourably refers to McLauchlan’s view of Tremodrui, a

ring. He further shews the similarity of the names Tremodret and Rosemoddress, in both of which Cornish localities are stone Circles.

The same writer has figured a fragment of the interesting ancient British Urn found within Duloe Circle when the hedge, which he reasonably surmises was part of the original tumulus, was demolished. The urn was well-designed, it had handles, and its ornamentation (consisting of cuts or notches, made with a stick whilst the clay was soft), although rude was effective. The presence of the urn is, of course, indicative of early cremation.

We have now seen that the pre-historic Stone Circle,—more like a Giant's thumb-ring, or bracelet, than his belt,—may have given rise to the names Tremadart and Stonetown, but probably not to the main tract of Duloe, the land of the flowing lake.

Still, even Tremadart, or Tremodret, may be derived from sources other than Tre-moderuy.

Tre-maes-derow would signify the dwelling by the field of oaks; and in Bannister's Glossary many other explanations of the name are quoted or offered, but we have not space here for their further notice.

It will, however, be well for us to refer, lastly, to a few phrases in which the word Tu, or Du, is used in a sense similar to that in which it seems to occur in Du-loe.

The late Dr. Borlase, Pryce, and Williams all give it, and from them we take the following quotations of it:—

Tu, teu, tew, thew, by mutation Du, (noun masculine); a side, part or region; like the Welsh and Armoric, tu; Irish and Gaelic, taobh, toib; Maux, chew.

Pop ay du, written also Pub tu, Pup tu, or A bub tu,—on each (or every) side

A y du,—on his side.

War tu dylarch,—on the part behind.

War tu tre,—on, in the direction of the dwelling or town,—on towards home.

RECOVERY OF A LOST RING.

(Communicated by the Rev. CANON SALTREN ROGERS, M.A.)

In the summer of one of the years from about 1866 to 1869, I was sailing with some friends in Falmouth Harbour. We landed and dined on the beach, on the right as you look towards Place House, opposite to St. Mawes, the tide being low. Two of our ladies remained for half an hour on shore, to sketch, and, meanwhile, we cruised in St. Mawes creek. I was steering with my right hand, and, with my left, held the painter of the punt which was to fetch the ladies from the shore. The wind was light and puffy, and as the punt kept running into our stern, I let the painter slip through my left hand, to give her more scope. After the ladies had returned to the yacht, I missed, from my left little finger, a diamond ring. I was not sure that I had brought it with me, but my friend's wife assured me she had observed it glistening while we were dining. We searched carefully for it, on board the yacht, and, not finding it, I gave it up, with a good grace, for lost;—concluding that it had been drawn off the wet finger, as the painter slipped through my hand. As far as I can remember, we could not have been less than one or two hundred feet from the shore, when the ring was thus lost overboard.

About the month of February, 1882, two little boys, Peter Edgar, aged about 6, and Richard Vincent, aged about 7 years, were playing on the beach, sailing toy boats. The tide, which was within an hour, or so, of its full height, had left a little pool, just where the rocks begin to show through the sand, below the left or inner corner of the wood, at the point where the South East shore of St. Mawes creek bends in towards Place. It was within about 10 paces of the highest tide mark, within 3 feet perpendicular of the highest level. In the pool was a piece of wood with some bright green seaweed attached to it; Peter, on taking the wood out of the water, saw a ring on the sand at the bottom of the shallow pool.

He took it to his mother ; it proved to be my ring, identified by the inscription inside, and by a slight fault in the cutting of the diamond. On finding that I was the owner, about three months after, she restored it to me.

It had been re-enamelled, shortly before it was lost, and when found showed no signs of wear. I think it unlikely that it could have been washed up from the bottom of the sea. The motion of the waves would be but small at that depth, and their effect, if any, would be, on the principles of ore dressing, to sink gold and diamond deeper. If it had fallen on seaweed, it would have found its way through any mass of weed before it had reached the shore at nearly high water mark. The only probable alternative is that it had been swallowed by a fish, and voided after an interval of from 13 to 16 years. The recovery was so remarkable, that it seems worthy of being recorded in the Journal of the Royal Cornwall Institution. I have delayed sending an account of it, not having been able to accompany Peter Edgar to the spot till within the last few days, when he showed me, as far as he could remember, exactly where it was found.

INSCRIBED STONES OF CORNWALL.

By Rev. W. IAGO, B.A. (Past-President, and Co-Editor of the Journal, of the R.I.C.
Hon. Local Sec. for Cornwall, of the Society of Antiquaries, London).

The following remarks are offered in continuation of some former Notes on Inscribed Stones published by me, from time to time. They are not intended to be more than brief allusions.

THE SOUTH-HILL INSCRIBED STONE.

In 1891, the late Mr. Samuel J. Wills, of Wheal Ruby Board Schools, was searching at South-hill, near Callington, for a stone cross described by Mr. Blight,—at page 66 of his “Ancient Crosses in East Cornwall,”—as being in the Rectory Garden there, but he was unable to find it, and it is not at present known what has become of it. Mr. Wills, however, in the course of his search, made a very interesting discovery.

He found, amongst the stones of an artificial rockery in the Rectory grounds, an Inscribed Early Christian Monument, utilized for ornamental purposes, as a rugged piece of granite. It was thrust head-downward, diagonally, into the ground, to allow of its roughly pointed base appearing as part of the rockery.

On observing that letters were cut upon it, Mr. Wills sketched the stone and its markings, as far as he could trace them, and sent diagrams of them to the editor of the *Western Weekly News*, at Plymouth. His illustrations and description were published in that paper on October 24th, 1891.

In consequence of the awkward position of the stone, which was partly buried, he was, of course, unable to obtain either an accurate or a complete copy of the legend.

Mr. Langdon, who was in London, had meanwhile informed me of Mr. Wills's discovery, and they both wished me to ascertain the true reading.

By invitation of the Rev. John Shaw, Rector of South-hill, I visited the stone on November 4th, 1891, in order that I might decipher the full inscription. To facilitate this, Mr. Shaw had the stone dug up and removed, a process which involved considerable labour, in which he and I, with the Rev. H. Hammond and several others, took part.

When the stone was laid flat, entirely exposed to view, and had been carefully washed, before re-erection, I succeeded in reading the Inscription, and in taking some very distinct rubbings of it.

On my making known the legend to those who had been taking a personal interest in the matter, Mr. Wills, the original discoverer of the memorial, expressed to me his satisfaction at the elucidation. I published the full reading Nov. 6th, 1891.

At the next Meeting of the Members of the Royal Institution of Cornwall, at Truro, Mr. Wills was present, by my invitation, and availed himself of the opportunity of examining the rubbings, which clearly shewed the whole legend. Death has since removed Mr. Wills from our midst, and his loss is very sincerely regretted. He died July, 1st, 1892.

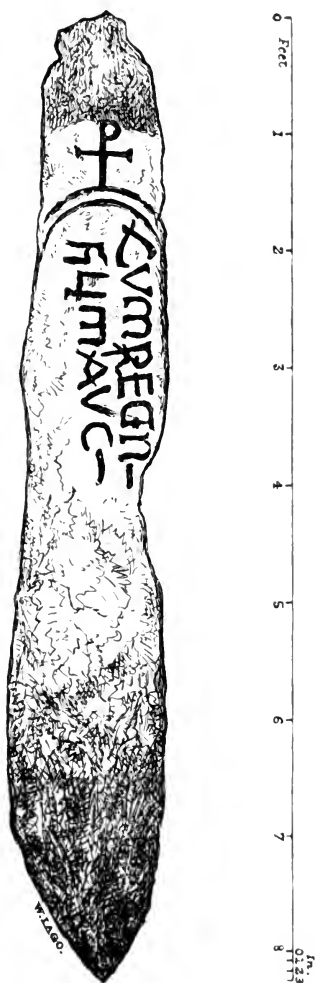
Sir John Maclean, F.S.A. (our President at a later date), as Editor of the Bristol and Gloucestershire Archæological Society, asked me, soon afterwards, if I would supply him with an illustration of the stone for that Society's XVIth Volume of Transactions. I agreed, on condition that if I drew the stone on the wood, for the engraver, the block should be eventually returned to me. This was done, and the illustration is now here inserted. (See Plate A.):—

The reading is as follows:—

On the upper part of the front face is incised the well-known and oft-found, Christian symbol, the Chi-Rho Monogram for "Christos" (Christ),—the characters being conjoined in upright-cross form.

Two curved lines, below this, brace together the two memorial rows of letters relating to the deceased person. The two lines of inscription run perpendicularly down the face of the stone.

XP (*conjoined*). Cum regni fili Mauci.



EARLY CHRISTIAN MONUMENT
IN RECTORY GROUNDS, SOUTHILL, CALLINGTON

These form the words "Cumregni fili Mauci," from which we see that the stone originally marked the tomb "of Cumregnus son of Maucus." The **fi** and the **li**, are in ligature; and the final **i** of each proper name is recumbent.

In date, the Monument, as shewn by its style of lettering, belongs to the latter part of the Romano-British period.

Other illustrations of the stone have been published, since mine, in the Journals of other Societies, but they do not invalidate my reading. (See also the *Antiquary*, Vol. 25, p. 184).

THE ST. HILARY...."NOTI....NOTI" STONE.

As the legend on this stone (called for convenience "the noti-noti stone") admits of various opinions with regard to its true meaning, I insert an engraving here, in which I have drawn, to scale, its various incisions. It has been already published by me, elsewhere.



This stone is likewise one of the late Romano-British Christian sepulchral-monuments found in Cornwall. It has often been described and incorrectly figured.

It has been set erect, and reads downward. I have not shewn its uninscribed portion.

Professor Hübner, in his work, relating to this and other such stones, published at Berlin, has rightly remarked :—"lectio incerta."

He has mentioned one of my suggestions as to a tentative reading, but I have never yet offered any reading of this legend which has appeared to me conclusive.

Whether the incisions are intended for a grouping of symbols and letters, or whether they are all letters (single, conjoined or in monogram), may be questioned. I certainly do not regard any of them, as some have done, as intended for figures of "masons' tools," or their craft-marks. If all form letters, as in my opinion they do, it has been surmised that they may stand

for, { Angnoti.
 { Angnoti.
 or for, { Congnoti.
 { Congnoti.

or, for some differently spelled names (of the deceased and his father) in the genitive case. The Rev. Canon Browne, late Disney Archæological Professor, and others, have sent me some suggestions; if more can be kindly forwarded to me they will be welcome, and I may be able to acknowledge some of them in my volume on the "Inscribed Stones of Cornwall," which has been many years in preparation, and has lately been announced for publication.

THE BLEU-BRIDGE STONE, GULVAL.

This well-known very interesting memorial (similar in class to the foregoing) was washed down from its position, into the bed of the stream, during the floods last Autumn, but the Vicar of the Parish, the Rev. W. W. Wingfield, of Gulval, Dr. Hugh Montgomerie, of Penzance, and others, with praiseworthy promptitude, took steps as soon as possible for its rescue, and had it re-erected, not far from where it had previously stood—but on a safer site.

It has been often figured and described (see Dr. Borlase's *Antiquities*, Plate XXX; also my drawing of it in Vol. 8, p. 336, of this *Journal*; &c.)

In reply to my enquiries, made as soon as I had heard of its fall, the following accounts reached me:—

“Penzance, 16th November, 1894.”

“... The low lands are still under water. The Inscribed Stone has not been forgotten. It apparently has fallen close by where it stood, for I am told the iron hand-rail is still attached. At present it is quite impossible to get at it, the depth and force of the rushing stream are so great.... Precautions are taken as to its being rescued.....

(Signed) G. B. MILLETT.”

“Gulval Vicarage, Nov. 17th, 1894.”

“....I inspected the stone to-day. Its foundation gave way, and the iron rail seems to have served a good purpose by lowering it gradually into the water. When the time comes, I will see to all care being taken as to its re-erection.... When I first came to Gulval this stone formed part of the foot-way at Bleu-Bridge; and the late Mr. G. Dennis John placed it, for preservation, in its late upright position, over 50 years ago....

(Signed) W. W. WINGFIELD.”

“5, Clarence Place, Penzance,
Wednesday night, Nov. 28th, 1894.

“....Mr. Wingfield and I superintended the fixing of the Inscribed Stone at Bleu-Bridge in a far safer position to-day... The day after the storm and flood I made arrangements for its recovery, and I afterwards found Mr. Wingfield had interested himself in the matter.”

“I enclose a rough sketch of the stone with the accurate measurements. [Length, 7-ft. 9-in.; width, 1-ft. 8-in., and 1-ft. 9-in. at top and bottom portions, and 2-ft. across centre; thickness 1 foot, near the ends, and 1-ft. 2-in. in the centre]...”

(Signed) HUGH MONTGOMERIE, M.D.

(Hon. Sec. Penzance Natural Hist. & Antiquarian Society.)

“Gulval Vicarage, Nov. 29th, 1894.”

“...The Memorial has been fished out of the stream and re-erected without having suffered any damage whatever... . The stone is now placed, about 20 feet S.W. of its former position, by the side of the pathway leading to the Bridge, and against the hedge, a better and safer position in every way.

The iron hand-rail came off in the fall, happily without causing damage....

Yours very truly,

To Rev. W. IAGO,

(Signed) W. W. WINGFIELD.”

Westheath, Bodmin.

Further notes on Inscribed stones are reserved for future
insertion. W. I.

Obituary 1894.

By the death of Mr. Walter Hawken Tregellas, the Institution has lost one of its most talented and able members, one who took a deep interest in its proceedings, and in all that related to his native county.

Walter Hawken Tregellas, the eldest son of Mr. John Tabois Tregellas—the author of the well-known *Cornish Tales*—was born at Truro, on July 10th, 1831; and was educated first at Trevarth School, Gwennap, and afterwards at the Truro Grammar School. He entered the War Office in 1855, and rose gradually to the important post of Chief Draughtsman, to which he was appointed in 1866.

He retired from the War Office in August, 1893, and was looking forward to devoting his leisure time to those Archæological pursuits, of which we should have experienced the benefit, had we not been deprived of the harvest of his mature years, by his sudden death. It will be in connection with his native county that Mr. Tregellas's name, as an author, will be best remembered.

In 1878 he wrote a guide to Cornwall for Mr. Stanford's series of guides—concise and terse, yet containing all needful information. No better book can be in the hands of the visitor to the county.

In 1884 he published his most important contribution to our historical literature, "*Cornish Worthies*," being sketches of some eminent Cornishmen and families. Here we find the lives of representative Cornishmen, told well and truly—the book is a mine of information, founded on painstaking investigation, interspersed here and there with graphic touches of word painting.

To the first volumes of the *Dictionary of National Biography* Mr. Tregellas contributed the lives of many eminent Cornishmen, and for the *Art Journal* and the *Magazine of Art* he wrote papers on "*The Moorlands and Glens of Cornwall*," and

"Artists' haunts," "The Western Cliffs," and "The Lizard;" distinguished by their artistic appreciation of our Western scenery. To the Nineteenth Century he furnished an article on "Cornish Characteristics," whilst to our own Journal he was a valued contributor from time to time. Amongst his papers are "Notes on Richard and John Lander," "Notes on Truro Grammar School," "Seal of Thos. Collins," "The Laocoon," "and Henry Bone."

Mr. Tregellas's poetical ability is well shewn by his fine sea ballad—"The wreck of the British fleet under Sir Cloudeley Shovel," which was printed in the *West Briton* of Oct. 3rd, 1878.

Beyond his contributions to the literature of his native county, his writings comprise "China, its history and people," "A History of the Coast Defences of England," "The Royal Horse Guards," and "The Fortifications of Malta;" whilst to the *Archæological Journal* he contributed several papers, including "Castle Dinas Bran," "Cæsar's Camp at Wimbledon," and "Simpson's Moat, Bromley"; but his principal work, and one to which he devoted several years of patient study and laborious investigation, is a History of the Tower of London, with biographies of the chief prisoners who were there immured;—this work is still in MS., and arrangements for its publication are being made.

In his private life, Mr. Tregellas's genial disposition and kind heart warmly endeared him to a wide circle of friends. He possessed the most varied attainments, and his knowledge he delighted to impart freely to others. Like his father he was most humorous, and never happier than when he had a little band of children around him at home, or in the fields pointing out some scarce flower, or teaching them to distinguish the note of some rare bird; or with a brother Cornishman discussing some knotty point in the history of his beloved Cornwall.

Mr. Tregellas married in November, 1861, Zoë, third daughter of Mr. Charles Lucas, then Principal of the Royal Academy of Music of London.

Mr. Tregellas had been unwell for some time, and was staying at Deal for the benefit of his health; while on the beach, there, on Sunday, 27th May, 1894, he was seized with an attack

of apoplexy—(brought on by excitement on the return of the lifeboat from "The Goodwins)"—from which he never rallied. He passed peacefully away on May 28th, aged sixty-two.

He was, on the 30th of May, laid to his rest, in the Deal cemetery, followed by sincere friends; and the four boatmen (at his widow's request) acted as bearers—they having, on the Sunday, borne him from the beach. A talented Cornishman "de la vieille roche." Our county is the poorer for his loss.

H. MICHELL WHITLEY.

The lamented death of Dr. Edmund Rundle, F.R.C.P.I., on the 14th January, 1894, at Umtatli, South Africa, was a sad shock to his friends in this country; he had been a member of the Institution since 1885, and was placed on the Council three years after.

His residing at Porthleven, before coming to Truro, enabled him to devote attention to his favourite pursuit, Pisciculture, and the Museum has been enriched with many excellent casts of fish, of his making. Our Journal contains papers on the "Instinct of Fishes," and on the investigation of the habits of the Torpedo Ray, both from his pen.

Mr. Rundle was awarded a medal by the Royal Cornwall Polytechnic Society, for an apparatus he invented for smoking fish.

He was generally interested in most branches of science, and took a leading part in those societies with which he was connected.

The loss to science of Mr. William Pengelly, F.R.S., deserves more than a passing notice. Formerly an honorary member, of the Royal Institution of Cornwall and a contributor to its Journal, he evinced an interest to the last, in its proceedings.

Though a resident at Torquay for 50 years, he was a Cornishman by birth, and made for himself a world-wide reputation by his explorations in Kent's Cavern. He was one of the most distinguished Geologists of his time. He may be said to have made the Museum in the Babbacombe Road, Torquay; and was Honorary Secretary of the Torquay Natural History Society.

His gifts to the Ashmolean Museum, Oxford, were invaluable, and he was one of the chief of Cornwall's living men of science. His decease is much felt in Devon and Cornwall. He died March 16, 1894, aged 82 years.

Royal Institution of Cornwall.

SPRING MEETING, 1894.

The Spring Meeting of the Society was held in the Museum Buildings, Truro, on Friday, the 22nd of May, 1894, Mr. John Davies Enys, F.G.S., the President, in the Chair. There were also present a large number of members and their friends, including ladies.

The President delivered his Address, which he commenced by inviting all, who might be able to do so, to send in lists or items of information, from time to time, illustrative of the occurrence of rare trees or other objects of interest in the county. He desired that such might be tabulated for the benefit of students and of the Institution generally, and then he entered upon the subject of portraits of celebrities connected with Cornwall, and called attention to the chief characteristics of Cornish Churches. He also surmised why it was that so many churches in the West of England fell into a state of ruin and needed much renewal in the 14th and 15th centuries. The address will be found separately given.

Mr. Howard Fox, F.G.S., President of the Royal Geological Society of Cornwall, described an interesting rock at Dinas Head near Padstow.

Mr. Wünsch, F.G.S. commented on the importance of Mr. Fox's discovery. The Paper itself is inserted at a subsequent page.

Rev. W. Iago, B.A., Hon. Sec. for Cornwall of the Society of Antiquaries, London, gave an account of his careful examinations of the very interesting Ogham stone which had been discovered by Mr. A. G. Langdon about two years previously, at Lewannick near Launceston. He referred to Mr Langdon's

published accounts and illustrations of this early Christian memorial, and gave the discoverer full credit for his find, as well as for the able manner in which he had elucidated nearly every mark upon it.

Mr. Iago stated that Ogham stones had been long sought for in Cornwall, as they were known to exist in Ireland, Wales, and Devonshire, and had been traced as far towards Cornwall as the eastern side of the River Tamar. For a great number of years Mr. Iago and the late Mr. Hawker the Vicar of Morwenstow, as well as Professor Rhys and other antiquaries had been seeking for Ogham stones in Cornwall, especially in north and east Cornwall, but unless it should be found that Professor Rhys was correct in regarding some marks as Oghams which he had discovered on the Slaughter-Bridge stone, it had remained for Mr. Langdon to have the honor of being the first to find such a monument in the County. It had been recognized that if any such memorials were to be discovered in Cornwall, they would most likely be met with not far west of the Tamar, and Mr. Iago had often expressed such an opinion. He was therefore, he said, able to enter very fully into the pleasure which Mr. Langdon had felt when the latter identified this example in that region. He could quite understand the joy it had given him, and offered him sincere congratulation.

Mr. Langdon had taken excellent rubbings of the stone, showing the incisions. The inscription was cut in two alphabets, viz: in Roman letters across the face of the stone, and in Ogham characters up one angle of the monument. He, Mr. Iago, had visited the stone more than once, and read the inscription for the most part the same as Mr. Langdon had done. All the marks described by the discoverer were found,—and there were, in addition, one or two others which seemed to have been overlooked, and these were important. Every stroke in a letter had to be taken into account, for if one incision were omitted the true reading might be lost sight of. He (Mr. Iago) had told Mr. Langdon, before informing anyone else, how he considered the words should be read. Mr. Langdon seemed to acquiesce in the amended view of the lettering—having written to say that he was “converted to it,”—he had not however published any altered version in accordance with it, and Mr. Iago therefore

thought that, as two years had now elapsed, and his own reading of the legend had not yet been announced, it was time that he should make it known. Mr. Langdon had, he considered, missed seeing part of the third letter of the Latin Inscription, consequently Mr. Langdon read the words *IN CENVI MEMORIA* whereas he (Mr. Iago) read them *INGENVI MEMORIA*. The difference between C and G altered the name of the deceased person commemorated, and affected other considerations of importance.

According to Mr. Langdon's C, the name would be regarded as "Cenuus" and might be taken for a Celtic name Latinized, but according to Mr. Iago's reading of G, the name appeared to be none other than the very well-known Latin Cognomen "Ingenuus."

The Ogham characters on the angle of the stone support Mr. Iago's reading, inasmuch as certainly a G and perhaps an NG can there be traced in the duplicate rendering of the name. Mr. Iago quoted other Roman inscriptions in which the name Ingenuus has been found.

He then pointed out, by means of diagrams, a full collection of Ogham characters and how they are to be read, and gave descriptions of several other stones on which such markings occur. He also shewed how ingeniously Professor Rhys of Oxford and Mr. Romilly Allen of London had arrived at an interpretation of the Lewannick Oghams on a particular portion of the stone where the marks were somewhat irregularly and unusually arranged, but neither Mr. Rhys nor Mr. Allen had seen the stone itself.

The President remarked that this valuable ancient relic had run a risk of being lost to science, for on a personal visit to the stone he had been informed that, some time ago, it had been proposed that it should be taken up, out of the ground, that it might be cast away as useless. Fortunately it still stands where it has stood from time unknown. Antiquarian friends should keep an eye on such things.

Mr. E. A. Wünsch, F.G.S. read a paper on "Diamonds and the Kimberley mines of South Africa," remarking that for the technical and statistical part of his paper he was indebted to his

friend Capt. Quintral, late of Wendron, now a Chief Inspector of mines at Kimberley. The paper was illustrated with Mr. Wünsch's own notes and by geological diagrams. Reference was also made to the splendid collection of models of some of the world's most celebrated diamonds and other gems now exhibited in Truro Museum.

Mr. Rupert Vallentin contributed some "Notes on Pelagic life, occurring in the sea of Falmouth Harbour, in 1893."

Mr. R. N. Worth, F.G.S. also sent a paper, relating to "Rude Stone Monuments in Cornwall."

These last papers will be found included in the present number of this Journal.

Rev. W. Iago exhibited a fragmentary inscription, dated 1557, found in Bodmin Church, also a rubbing which he had taken of the old slab formerly displayed in the front of the Lepers' Hospital at St. Lawrence, Bodmin. Its inscription, dated 1586, recounts the liberality in 1582 of Richard Carter, of St. Columb, merchant, towards the poor lepers, the concluding words being:—"Whose charitable and rare example in oure tyme, God graunte mani to followe hereafter." The property has since been transferred to Truro Infirmary where any leper can now claim to be cared for accordingly. The Lepers' Hospital Seal was also shewn,—much older than the slab;—and other seals were likewise on view, some having reference to past and present Diocesan officials and having been designed by Mr. Iago.

Many valuable gifts to the Museum and Library were announced, a list of which is appended.

Mr. Norway, M.R.C.S. proposed, and Capt. Bryant seconded votes of thanks to Donors and to contributors of papers.

Mr. Daubuz proposed, and Mr. Millett, M.R.C.S. seconded, thanks to the President for his able conduct in the chair.

These propositions were agreed to, unanimously.

GIFTS TO THE INSTITUTION.

The gifts to the library and museum of the Institution since the annual meeting on November 28th, 1893, include—

Library—Portraits of Professors Huxley and Tindall, given by Mr. J. D. Enys; "The Age of the Saints" (Borlase), Mr. Joseph Pollard, Truro; Address by the Marquess of Bute,

written for the Rhyl Eisteddfodd, the Cymmrodorion Society; New South Wales, statistics, history, and resources, 1884, the Agent-General of New South Wales; Original Letters of Sir Beville Grenville, Kt., Mr. St. David M. Kemeys-Tynte; photographs of the Cornish Lord Mayor, Sir Isaac Pennington, of the reign of Charles I., Mr. Thurstan C. Peter; 13 vols. of Sir William Jones's works and several years' proceedings of the Royal Geographical Society, the Rev. Canon Moor, St. Clements; histories of American schools for the Deaf, vols. 1, 2 and 3, the Volta Bureau; a number of theological works, from the Swedenborg Society; several geological works from Mr. J. D. Enys, F.G.S., President of the Institution.

Museum—Specimens of quartz crystals, Captain Provis, Camborne; pair of snow shoes and Pompeian vases, Miss Mary Sophie Tucker (bequest); case of cross-bills, two stones worn by blown sand, from New Zealand, tropic bird in case, and six medallions (plaster casts), Mr. J. D. Enys, F.G.S., President; two eggs of the African (Congo River) grey parrot, laid in England, Mr. S. Harris, West Cornwall Bank; hen's egg containing a second complete egg in a perfect shell, Mr. Michael, Truro; collection of minerals, rocks, and precipitates from Rio Tinto, Mr. J. Osborne, F.G.S.; Chinese counting board, elephant's tusk, two elephant-teeth, auriferous quartz from Silensing mines, Malay pottery made in Pahang, Malay rice bag, and a hornbill, Capt. James Roberts, Silensing, Pahang; a collection of fossils from Trevone and Constantine Bay, near Padstow, including the beautiful little cockle *cardiola retrostriata* (*cardium palmatum*) which is a typical upper Devonian fossil, by Mr. Howard Fox. In regard to the latter the cephalopods were determined by Mr. G. C. Crick, F.G.S., of the British Museum. Mr. Fox also gave a coin found at Carn Brea, near Redruth, identified at the British Museum as of Micipsa, King of Numidia, B.C. 148-115.

ADDRESS BY THE PRESIDENT,

JOHN DAVIES ENYS, Esq., F.G.S.

I shall begin what I have to say, to-day, by throwing out some suggestions as to what might be undertaken, by Members of the Royal Institution, with advantage to the Cornish student. As example is better than precept, I give samples of what I mean. I appeal to all members to help, and I shall especially ask some of my lady friends to give us their assistance.

First, I give a list of portraits,—painted, engraved, and sculptured—of Davies Gilbert, as an example of one such branch of work :—

Oil Painting, by John Opie, 1806, at Treliissick.

Do. Copy of same by E. Opie, at Enys, dated 1871.

Do. by H. Howard, 1827, at Enys.

Do. at Gawdy Hall, in Norfolk.

Do. Copy by E. Opie, at the Polytechnic, Falmouth.

Do. by Thomas Phillips, R.A., at the Royal Society's Rooms, London.

Do. by R. L. Lane, at Tehidy.

Do. (small) also by Lane, at Treliissick.

Water-colour Drawing by Miss F. E. Howarth, Gawdy Hall, Norfolk.

Lithograph Engraving after drawing by Miss F. E. Howarth, 10-in. by 12 $\frac{3}{4}$ -in.

Engraving after H. Howard, by Sam Cousins, 9-in. by 10 $\frac{3}{8}$ -in.

Do. (smaller) published by Fisher & Son, 1828, 8 $\frac{1}{2}$ -in. by 5 $\frac{1}{2}$ -in.

Do. the same size, Taylor's National Portrait Gallery, 1846.

Do. (small) by S. North, 5-in. by 4 $\frac{1}{2}$ -in. size of plate.

An engraving of Westmacott's bust by W. D. Lath,
published by Thos. Lean, Athenæum portraits,
No. 13.

Do. after Howard, by J. Thompson, $4\frac{1}{2}$ -in. by
 $3\frac{1}{2}$ -in.

Bust at Pembroke College, Oxford, by Westmacott, jun.

Cast of same, at Enys.

Do. at Trelissick.

Do. at the Polytechnic, Falmouth.

Do. at Gawdy Hall, Norfolk.

Do. at Hastings.

Busts at Trelissick and Tehidy, in marble.

I would suggest that a similar list of portraits of Sir Humphry Davy and of Sir Edward Pellew, Lord Exmouth,—our first president, would be of interest. I mention these two names as those of persons well known; but a correct account of any engraving, painting, or bust of any Cornishman, furnished to our Curator, might be filed in our library and be accessible for future reference at any time.

Another work which would be of great value, would be a list of views of our castles, churches, crosses, and other antiquities. A list of views of Truro Church would amount to a greater number than any one would think, till he tries to form one.

Country houses, again, would be of interest, especially if dated; take Trelissick for instance. In C. S. Gilbert's history it is shown before the portico was added; his book was published in 1817-20. In "Cornwall Illustrated," published in 1831, it is shown with the portico, and in some future work may appear with further extensions as it now stands.

I fear that a list of views of St. Michael's Mount would itself fill a book, as they are innumerable. Several large collections exist to my knowledge.

I also give the beginning of a list of rare or unfamiliar trees, and trust I may receive accounts of many more.

Trees of FRAXINUS, (entire-leaf Ash.)

At Enys, Grove Hill, Trelowarren, St. Columb Major, in front of Perran Foundry on the public road, Carclew, two at Penrose.

Trees of *SALISBURIA ADIANTIFOLIA*, (Ginko tree of China and Japan.)

At Enys, Carclew, Penrose, Penzance.

Trees of *FAGUS*, (Fern or Split-leaf Beech.)

The finest I know is at Pencalenick ; there are two at Enys, one at Grove Hill, and other places.

An index, however short, to any of our County Histories, such as Polwhele's (in which is hidden a great deal of information) would be of real service. Such an index, showing to what part of Hals, Tonkin, Davies Gilbert, Polwhele, Hitchens, Drew, C. S. Gilbert, Lysons, &c., and the 4 volumes published by Lake, a student could turn to find any parish, would be a great help to research, especially if local books on any such parishes were also mentioned. In the *Collectanea Cornubiensia*, a partial index to Lake's publication is given.

Extracts from the Parish Registers, in which are recorded the collections for rebuilding churches,—such as St. Paul's in London,—and other purposes, and the payments for vermin destroyed, would be of interest to many, especially to lovers of natural history, etc. May I ask our friends, the clergy, in each parish to help us by sending such extracts to the Royal Institution of Cornwall, Truro.

As an illustration, I give a few extracts from the register at Launceston. Money was collected for sufferers by fire at Oxford, in 1661 ; for the church at Pontefract in 1662 ; also for the church of Fakenham, in Norfolk.

I have chosen as the subject of my address:—

THE PECULIARITIES OF CORNISH CHURCHES,

in regard to which I desire to point out some of the respects in which they differ from those in other parts of England, and what has probably been the origin of the peculiarities, and of their prevailing forms. The earliest places of worship must have been the chapels or oratories of the first missionaries who Christianised the inhabitants of the country. Of these, we have the Old Church of Perranzabuloe, described by the Rev. Trelawny Collins,* (first edition 1836), also by Rev. W. Haslam,

* Mr. Trelawny Collins afterwards took the surname of Trelawny.

(1844, &c.); and the Oratory of St. Gothian, described by Blight in "Churches of West Cornwall," page 89, (1865). These buildings were simple rectangular erections, with only a slight mark separating chancel from nave. In both, the remains of stone benches existed against the walls. Perran Church owes its preservation to being covered with sand, and its subsequent destruction to the sand being removed. Indeed, the only carved work,—the key-stone and corbels as well as one of the carved side stones of the south door,—are preserved in our Museum. Drawings taken at the time of its being uncovered show a plain building of rectangular form with a south doorway and window, a second doorway in the east end to the north of the altar, and a niche (which may or may not have been a window) over the altar in the East wall. Under the altar were found the bones of three persons, headless, but the heads of all were found deposited together between the knees of the skeleton nearest the south wall. Succeeding these Oratories came the Saxon Churches, of which only small remains have come down to us. Indeed, of Norman times we have comparatively few arches, though the interesting set of Norman doorways, numbering about 27, and as many as 70 Norman or transition-Norman fonts, are certain proofs that the churches which still retain them existed (in perhaps less complex form) in Norman times, on the same site.

There can be no doubt that the oldest form of Cornish church consisted simply of nave and chancel. Later ones were cruciform. We have a number of churches still retaining marks of their origin from the cruciform. Blight, in his "Churches of West Cornwall," has pointed out that in St. Michael Penkevil and at Shevioc, we have that form retained nearly unaltered, and he points out one of the features of nearly all the Cornish churches, namely, that though they have arches opening into both north and south transepts, there is no chancel arch. This shows that for some reason the absence of a chancel arch dates back to early times. Further instances of this, of later date, occur at St. Columb Major and elsewhere. One of the most ancient of Cornish churches is that of Tintagel. The Rev. R. B. Kinsman, who has just passed away (in 1894) told me that the well known antiquary, Parker, of Oxford, was forced to admit that part of the north wall of the nave was Saxon work, and,

possibly, the north doorway, also. The south doorway is of Norman work, the chancel and both transepts of Norman transition and Early English, with traces of alteration at different times. One interesting feature of the south transept is that it retains a stone bench (like the old church at Perran) on the east and south sides. Later work is shown in other parts of the church, such as the tower, where a central spire is said to have formerly existed. The west window is one of the latest parts of the church, and was designed by my father (J. S. Enys) for Mr. Kinsman in the Perpendicular style, in keeping with the tower.

Cornish churches differ from most others.—

First, in the fact that so many of the chancels have north and south aisles, all ending eastward in one straight line, the chancel proper as a rule being not extended. In a few cases it may project a foot or more, but it then shows that the work has been added, as the stones are not bonded to the other parts,—Altarnun is an example of this.

Secondly, in all except three—(Lostwithiel, Fowey, and Callington),

IN THE ABSENCE OF A CLERESTORY

over the arcades of the nave; all three roofs being of an even height or nearly so. The church of Landulph is said to have had a clerestory formerly, and North Petherwin, (which should be included in Cornwall), has one, I am told. The recent restorations at St. Germans show remains of a clerestory of Norman date. In regard to the absence of the clerestory, I can only point out that in a windy county the lofty roof of a building is the first part to suffer, and in the absence of much snow,—respecting which the higher roof over the nave is of value in throwing off any which might otherwise lodge in the valleys between the roofs,—would not be wanted in Cornwall so much as in other parts of England.

Thirdly, in the fact mentioned before, that a chancel arch, especially in West Cornwall, is rarely found. The curious exception of the small church at Towednack near Penzance makes this church of great interest.

Fourthly, the fine massive towers of three or four stages, and the infrequency of spires. The beautiful spire of Lostwithiel, with its open arcade, stands alone in point of beauty in the county. The lofty spire of Bodmin was struck down by lightning in 1699.

In examining the churches, in order to trace the derivation of the typical form of three even roofs, we are met at once by the fact that many show the form of two even roofs with a north or south transept. In the alteration made by the taking down of one of the transepts and putting an aisle in its place, probably the wall most decayed was removed. The later typical form required that both transepts should be removed, and north and south aisles added. I find there are about 37 retaining the north transept, and about 22 the south transept; of those showing the typical form there are 80, only a few retain the cruciform shape. On first entering the church of Manaccan I was struck with the fact that the north side of the roof of the Early English chancel was carried on granite corbels, not on the arcade separating the chancel from the north aisle, and I was much interested in making out the cause to be, as Blight has shewn, that when the north wall of nave and chancel were taken down, and an arcade took its place on the line of the north nave wall and continued parallel with the chancel, the arcade would not carry the roof of the chancel, as the nave was wider than the chancel. To obviate this, granite corbels were put on the arcade to carry the roof timbers, thus pointing to a time when the church was cruciform. The church at Zennor is also of this form.*

* I have to thank the Rev. Preb. F. C. Hingeston-Randolph for the following: "There are some curious cases in Cornwall of the substitution of aisle for transept having been begun and then abandoned, Zennor for instance, St. Levan, and St. Eval. These cases show the *modus operandi* exactly. The first thing done was, before any unroofing or removal of the transept, to build two arches of the intended new arcade across the opening into the transept. The width of the opening was always insufficient, and the builders used to dig into the nave wall, by way of making the opening wide enough to admit two arches corresponding exactly with the two opposite ones in the completed arcade. This saved the necessity of throwing open the church to the weather up to the last possible moment.

At Zennor, the north aisle is complete.

„ the south aisle incipient.

At St. Levan, the south aisle complete.

„ the north incipient. (See Blight's "West Cornwall Churches," for a drawing of this, p. 13, 1st edition).

St. Eval do. do.

St. Mawgan-in-Meneage, "

I have no reason to give for

THE ABSENCE OF A CHANCEL ARCH,

other than that it was the custom of the county, and the exceptions such as Bodmin, prove the rule. I think the addition of such an arch in some restorations unjustifiable, as giving a false form to the buildings so altered, unless the date is marked on some prominent part of the arch. Of Norman work, Cornwall has a fine set of doorways and fonts. In the church of Morwenstow, the north arcade and some of the north wall are of Norman work: at St. Breward there is a Norman arcade. Kilkhampston has also work of the same period. In Lelant, one arch in the nave arcade is Norman; at St. Germans, there are considerable remains of Norman work, in the bases of the towers the great west doorway, and a portion of the nave arcade. Norman doorways exist in Mylor, north and west; south doorways at Cury, Landewednack, Manaccan, St. Anthony-in-Roseland, Kilkhampston, Lanteglos-by-Camelford, Launceston (in the hotel, taken it is said from the old Priory), St. Martins-by-Looe, St. Michael Carhayes, Morwenstow, and Tintagel. Norman fonts amount (as I have said) to more than 70 in number. Certain forms of fonts seem to be common in particular districts, such as the form with four angels' faces, one at each corner, common in many districts. Again, other fonts of the transition-Norman form,—one of the largest being at Altarnun,—occur at Laneast, Warbstow, Jacobstow, St. Thomas's-by-Launceston, and (a very rude one) at Callington, &c. Botusfleming and Linkinhorne are alike. The Padstow font is later, and like that at St. Merryn, which is said to have come from the chapel of St. Constantine, near Trevoise Head. The base of the font at Sennen has an inscription, dated 1441, or from one to three years later, recording the dedication of the Church, and at Landewednack is a curious font with an inscription in the style of the 13th or 14th century. Many other different forms are found. The fonts raise a question of great interest, Saxon work, or copies of such work being shown on many. The interlaced patterns and serpents carved on numerous examples are especially interesting. A few altar slabs have come down to us, a fine one, found used as a paving-slab, is on the communion table at Tywardreath. Another, used as a monument for a Carminow, is at St. Michael Penkivel.

PERPENDICULAR RENOVATIONS.

It was for a long time a puzzle to me why we had so many churches showing such a great prevalence of Perpendicular work, either with pointed or, as in many small churches, with square-headed windows of the same date, also with arcades of 4-centered arches, and again in later times of 5-centered arches. This puzzle has now been cleared away, and, like many others, had its answer under one's eyes, if only one would have taken the trouble to appreciate the cause. The first hint, I obtained from the review of a book in the *Athenæum* newspaper. The book reviewed is one by Francis Aidan Gasquet, D.D., published in 1893, and called "The Great Pestilence, A.D. 1348-9." This book gives an account of the spread and effects of the pestilence of that date, which afterwards became known as the Black Death. I gather from this book enough to show my meaning :—

The Pestilence first reached England about August, 1348. It appeared at Melcombe Regis in the month of August, and spread along the coast by means of ships, and along the lines of pack-communications inland. It originally came from the East in ships, reaching Venice and Marseilles about the same time, passing through France to England. It caused death in a sudden way; men well in the morning were dead at mid-day; few lived to the third or fourth day, a few lived through an attack. One of the best ways of getting at the numbers who died is by referring to the Bishops' registers, which record the institutions to all vacant benefices, but do not contain the vacancies amongst the curates or chaplains, which would probably double the number of clergy who died. The Patent Rolls record the presentations to crown livings, not only the King's own, but those to which he appointed as guardian of minors, and those belonging to alien houses which he had seized during his foreign wars. From January to May, the King presented to 42 livings; to 36 during the next four months, averaging below 10 each month; the yearly average would be below 100. From September to December he presented to 81; in 1349 from January 25th to May, 249; from June to the middle of September, 440; and from that date to the middle of January, 1350, 205, a total

of 894, or nine times the former number. Taking the presentations of the King, it would appear that the deaths followed the rivers. In one case, at Grimsby, a second presentation was made in three days. The country, it is said, took 150 years to recover its population. The Bishop of Bath and Wells, Ralph de Salopia, wrote to his clergy, January, 1349, concerning the mortality as follows: "it has left many parish churches and other cures, and consequently the people of our diocese, destitute of curates and priests." The Bishops authorised confession to laymen in case of necessity, and also, in extreme cases, to women, but provided in cases of recovery, a confession to the priest. Turning to the Diocese of Exeter, between January to September inclusive, 345 presentations were made as against an average of less than 40 per year.

BISHOP GRANDISSON'S REGISTER

is said by Prebendary Hingeston-Randolph to have been wonderfully well kept, and full of particulars, before the fatal time, but, after that, "entries were made hurriedly and roughly, in striking contrast with the neatness and regularity of the rest of the register." Some incumbencies lasted only a few weeks. Fowey for instance, and St. Winnow soon after, Bodmin following. The Prior of Minster died April 26th, 1349, and the "house was so impoverished by the deaths of tenants and labourers, that it could not support both its members and the chaplain they were bound to find, to do the parish work, (as neither the Prior nor his brethren spoke English)." At Bodmin, it is said, 1,500 died, only two being left alive at the priory. Now, what must have been the results of this depopulation of the county, as shown by the difficulty of supplying priests to take the services of the church? The first would be the failure to repair the churches, and the neglect of many of the usual services. We are told that the country went out of cultivation, and that many years were required to bring back the country to the state it had reached in 1348. When the revival took place, the first parts to feel its effect would naturally be those churches near the larger monastic institutions, and some of these show better work in their window tracery than most of the others. I think the extracts given will fully account for

A PERIOD OF RUIN,

followed, in the 15th century, by a revival and restoration at the period marked by the commonest style of our Cornish churches. So much has been done in modern days to improve the debased window tracery of churches, which had again been neglected, that many remains of old work have been lost to the present observer, who must look carefully for evidences of it.

THE WAGGON-ROOF

was another feature of old Cornish churches,—it displayed square panels and, at the intersection of the ribs, bosses, many of them well carved. I regret that cost has in many places caused the loss of this feature, in the restored churches. I am also aware of the fact that it is not a roof that commends itself as a strong form, for in consequence of the decay of the wooden pins, it throws an unnecessary strain on its support, either on the outside wall or on the arcade on which it rests. The chancel of St. Ives, the small church of Golant, and others in different parts of the county, contain certain good work of this kind. The carved work in the wall plate, matching the roof, is also a feature, and in itself a thing of beauty. In Golant, the wall plates contain Latin inscriptions, which have been arranged, not quite in the right order. They have, however, been read, thanks to the care of the late Rev. J. Wallis, (Vicar of Bodmin), when acting as curate there, assisted by Mr. G. White, of Torfrey, and consist of invocations to pray for the souls of some of those who contributed to the building, &c. Remains of other waggon-roofs are to be found in various churches in a more or less perfect state, some having been hidden by flat ceilings of lath and plaster.

THE CORNISH TOWERS

are a striking feature of our church architecture, which cannot be overlooked. They stand most frequently at the west end, and are in most cases, though not in all, connected with the church by a tower-arch. St. Columb Major has its tower with no west door; a low south and north arch are open to the air, and there is a small door leading into the church. Mawgan, in Pydar has its tower to the south; St. Enodoc its tower (with a spire) on its north side; Bodmin and Blisland a'so

have north towers; St. Blazey has only a south door in the tower, it was built against the country, and there was no room for a door, except on the south. The majority have three or four stages, ending with four large pinnacles, or bases for them; some have only battlements, and, from some towers, pinnacles and spires have been thrown down. The Grand tower of Probus is well known, and is said to have been built by the Master Mason who built St. Mary-Magdalen's at Taunton, but this conjecture must be regarded as very doubtful. Fowey tower, as pointed out by R. Carew, in 1602, is marked by the badge of the Earl of Warwick, the king maker, who was connected with the place, and thus gives a date to its erection. Some church towers were entirely isolated. The spires which remain are few (as I have said), and, with the exception of Lostwithiel, are not remarkable.

DEDICATION, FITTINGS, &c.

On the subject of the dedication of the churches of Cornwall I shall not enter further than to point out the intimate relations between many of them with Ireland and Wales on the one part, and with Brittany on the other. One, Falmouth, is dedicated to King Charles, the martyr.

Church plate in Cornwall can show several 16th century specimens, at Lamorran, Mabe, &c., and the Paris-marked chalice at Kea, dated about 1514-15 or 1537-8, is of a rare type.

Of interior fittings, I have to point to some good remains of carving in more or less perfect screens and bench-ends. These are, in some cases, dated about 1600, and show bold, deep carving of a characteristic kind. Many (which are much older) contain the emblems of the passion, grotesque figures, or coats of arms, which are of especial value, as showing date of execution. At Altarnun we have the screen still stretching across the whole church. In many, the upper part has been cut away, leaving the lower part only.

A full history of our church bells has been written by E. H. W. Dunkin; but I must mention the fact that, when Lanhydrock church was restored and the bell was taken down, the inscription, which was formerly said to be illegible, was discovered by the Rev. W. Iago to be a legend cast backwards and partly upside

down. "Æthelstan sumpta an sua,"—" [Bell named] Athelstan, purchased [by him] for [the good of] his own soul." There remain about 45 mediæval bells in Cornwall. The bell in the market house at Bodmin is one of the only two of the kind known to exist, the second being in France; instead of being of the ordinary smooth-sided form, it is corrugated, horizontally, like a crinoline.*

A special feature of our Cornish churches must not be forgotten, and that is, when one aisle or two were added, the chancel limits were most carefully marked, by the rood-screen, which stretched across, and by parcloes. This feature is one that must be borne in mind, when we say that Cornish churches had no chancels; true, as far as external appearance goes, but inside a church that retains its screen, such as Altarnun, the chancel is a distinctive feature. The chancel aisles had altars, such as formally existed in many transepts, as shown by piscinas, still remaining, though often mutilated. It may be remarked that in almost all churches retaining transepts, these transepts are of Early English date, though a few are of the Decorated style. Many retain their lancet windows, such as Tintagel and Laneast. In some cases the windows are of Perpendicular date, but were evidently inserted in the room of older work, as shewn by the mouldings of the splay arches. This is pointed out by the Rev. Mr. Price, in his paper on the Churches of the Deanery of East, a window of perpendicular work being placed,—in the north or Manaton transept at Southill,—in an opening still retaining mouldings of Decorated work. The church of Crantock is peculiar, as it has a nave, north and south transept, and chancel with chancel aisles under one wide roof, no doubt due to the fact of its having been formerly a collegiate church.

One characteristic of our later churches is the common use of the debased arch, known as the Tudor or 4-centred arch as distinguished from the pointed or two-centred arch; and, in our still later churches, the 5-centred arch, which has a much worse effect wherever used.

* See W. Iago's engraving of it inserted in Ellacombe's *Bells* (p. 451), and in Maclean's *Trigg Minor* (Vol. I, plate ▼III); also see R.I.C. *Journal* (Vol. X, p. 262).

The foundation dates of our churches as they originally stood are difficult to ascertain. Some of them, or of re-dedications, are recorded in the registers at Exeter. Certain structures have passed away, their places being taken by buildings of subsequent age; but the dedication helps us at times to date a part of a church, the original features of which have long since perished, and it is therefore of very great value, but in a few instances the dedications seem to have been changed.

Now I come to a part of my subject that may raise some discussion. I shall try, by only stating well known facts, to keep clear of blame, whilst in no sense hiding my own opinions. The subject is that of so-called

RESTORATION,

in which old and interesting features have been swept away, either through carelessness, ignorance, or on purpose. As an instance of carelessness, I may mention that in the alterations that restored St. Gluvias from a Grecian temple to a Gothic church, the arms over four figures of the Pendarves family were replaced so carelessly, that three out of the four shields were put over the wrong figures—the wife's over her husband's, the mother's over that of her daughter-in-law, and the son's over his mother's;—these displacements have since been rectified. Other ornaments were thrown away, and not replaced. At Buryan, the steps outside the north window of the chancel, placed there, it is believed, for the lepers to receive the sacred elements pushed out to them, through the window, on the end of a stick, were built up or removed. The destroying of the screen, carved work, and monuments at St. Mabyn in 1818 by the rector (who was recorded to have cleared the church, and made it tidy) I can only describe as done on purpose; this is put on record by Sir John Maclean. When visiting a Cornish church with a friend, a rector of a parish told me that he was going to take down all the monuments of former rectors which were in his chancel, and hide them away in the tower, or some place out of sight. The taking of carved work from one church and putting it into another is, I think, an act to be much regretted, as such work may have a history attached to it in one place, which is lost by removal, or, worse still, made to tell a false story. This is especially so where shields of arms are removed.

THE RE-CUTTING OF FONTS OR OTHER CARVED WORK,

is also much to be deplored, as the proportions are destroyed, and new work takes the place of that which was old. I also regret the change of the form of the roof. The new one is, no doubt, cheaper, and it may be stronger; but the character of the church is destroyed. Can any one standing at the west end of Fowey church, or St. Austell, and seeing the old and the new work in those churches, doubt this? In one church, I know of a small carved granite mortar or measure, which has been placed in the old niche for holding holy water. An interesting feature in Cornwall, is the use (in so many churches) of granite, which has caused a deficiency of fine and delicate forms of tracery; that stone requiring a bold and simple treatment; and here I would point out that the Normans, and their successors down to the beginning of the 14th century, never used granite. Where Polyphant was accessible, much more elaborate work was possible; and Catacluse stone, hard to work, also still shows the mark of the tool by which it was cut, its dark colour affording a welcome relief to those structures in which it is used for doorways or windows. Of recumbent monuments, Cornwall has few of early date; Landulph can boast of a late brass tablet to a Palæologus, one of the family of the Byzantine Emperors. The brasses of Cornwall are well described and figured by Dunkin. Frescoes formerly covered the walls of our churches, a favourite subject being St. Christopher, but they were subsequently covered with whitewash. In conclusion, I express a hope that my remarks will lead to the results, desired—further information on the subject of Cornish churches and their distinctive features, and the preservation of all objects of interest.

Since writing my address, I have become possessed of a set of the Transactions of the Devon Diocesan Architectural Society, and in a paper by Mr. Street, I find a most interesting account of Early-English and Decorated work remaining in Cornwall. Mr. Street points to the beautiful east windows of Southill and St. Ive, as first-rate examples of their date, mentioning also the early work at St. Austell, St. Germans, Sheviock, St. Michael Penkivel, and Gerrans.

St. Anthony in Roseland, carefully restored by the late Rev. C. W. Carlyon, chiefly at the expense of Sir Samuel Spry, is a good specimen of a cruciform church, the chancel of which was destroyed by the fall of the tower. Tradition says, this has been rebuilt on its old foundation. Here a Norman south doorway to the nave carries back its history to an early date. I regret to say that Lamorran and Grade are specimens of the destruction of cruciform churches carried out in the name of restoration, whilst at St. Just-in-Roseland the old monuments have been buried under the tiled floor.

A list of views of Cornish churches, and the books in which they are to be found, would open out a large field. In the *Gentleman's Magazine*, for instance, is a view of St. Erme. Separate memoirs of the church of St. Columb Major, by the Rev. P. Carlyon, are published in the *Transactions of the Exeter Diocesan Architectural Society*. In vol. iv, occur accounts of Morwenstow church by Lieut. Col. Harding; and of Callington church, by Rev. Æneas B. Hutchison, B.D.; whilst St. German's church is described by J. Furneaux, in vol. iii, p. 82; St. Burian, by John D. Sedding, in vol. ii, second series, p. 210; certain churches in the deanery of East by Rev. H. M. Rice, in vol. iii, p. 178; and under the name of "*Iter Cornubiense*," many of the same churches are illustrated by Charles Spence, Esq.

There are churches with detached towers or campaniles at Gwennap, Feock, Mylor, Gunwalloe, and Lamorran; the tower and spire of St. Hilary were unconnected with the church before the latter was burnt. Launceston tower is only connected with the church by a parish room.

Mr. J. R. COLLINS, in proposing a vote of thanks to the president for the foregoing address, referred to the existence of two old pictures at Altarnun, which he considered to date back to about the time of James I, representing the administration of the sacrament of Holy Communion. One was particularly curious, two candles being shewn as lighted upon the Table. The Table there was so placed, that the minister could go to the north side and walk all around if he chose. It stood in a middle space, away from the east wall.

The President remarked:—It does now.

CANON DONALDSON, seconding the vote of thanks, said they were certainly grateful for the remarks which the President had made with regard to restoration of churches. Serious mistakes had been made even in cases where restoration had been in the hands of architects who made that particular work their special study. At St. Keverne, the church contained features of unusual interest in the peculiar arrangement of its rood-loft passages. The restoration there had been carried out with great care, and the waggon-roof had been preserved; he could but express a hope that those who were deeply interested in the question of the architecture of our churches, and who had the means, would come forward and help those responsible, to restore St. Keverne Church even more completely than had yet been possible.

The resolution was carried unanimously.

ANNUAL JOINT MEETING OF THE CORNISH
SCIENTIFIC SOCIETIES, 1894.

On Friday, the 15th of June, the Second Annual Meeting of the Associated Societies of Cornwall was held in the Museum of the Royal Geological Society of Cornwall, at Penzance.

The following Papers were contributed on behalf of the different Societies :

1. "On Raised Beaches," by Mr. Edward A. Wunsch, F.G.S.—representing the Royal Institution of Cornwall.
2. "On some modern developments of Technical Education," by Mr. Frederick J. Bowles,—representing the Royal Cornwall Polytechnic Society.
3. "On Photography in Mines," by Mr. J. C. Burrows, F.G.S.,—representing the Mining Association and Institute of Cornwall.
4. "On some Fossils from the coast sections in the Parishes of Padstow and St. Merryn," by Mr. Howard Fox, F.G.S.,—representing the Royal Geological Society of Cornwall.

According to rule, the publication of papers read at each Joint Meeting of the Societies, takes place in the proceedings issued by the Society at the rooms of which the meeting is held.

Royal Institution of Cornwall.

ANNUAL EXCURSION, 1894.

On Tuesday, the 11th of September, in very favorable weather, the Members and friends of the Institution met at Par Railway Station—where breaks and other carriages were in readiness to take the excursionists to the various points of interest to be visited, under the leadership of Mr. J. D. Enys, F.G.S., the President.

Before leaving for more distant scenes, a short walk was taken to Tywardreath Church (St. Andrew's).

Mr. Evelyn Rashleigh called attention to the site of the destroyed Priory, and to many ancient relics preserved in the immediate locality.

We may here note that the name Tywardreath, like other Cornish names, is significant. Being derived from "Tre" or "Ty," a dwelling-place,—“war,” upon,—“treath,” a sandy-shore,—it tells us that the sea in former times extended more nearly to the spot than it does now. The bound to which it rose in early days was pointed out, and also the position of an old penny foot-bridge no longer existing.

Tywardreath Church has been restored chiefly at the cost of Mr. Jonathan Rashleigh, of Menabilly, the lay Rector, a former President of this Society; who is also the possessor of valuable manuscripts relating to the dissolved Priory, and to other mediæval foundations (see R.I.C. Journal, vol. v, p. 252; vol. vi, p. 213, etc.) In the church a slab remains inscribed to the memory of Thomas Colyns, the last Prior, who died in the 16th century. This ecclesiastic has preserved to us, on one of his seals, what is considered to have been the original pose of the famous Laocoon group of statuary, the broken remains of which, Michael Angelo seems to have incorrectly put together.

(For a summary of this discovery, see Maclean's Trigg Minor, vol. 1, p. 325). The Ancient Altar slab with its incised crosses, was discovered face downward, and is now carefully mounted for preservation, in the church. The Church and Monastery have been described by various well known writers, (Leland, Dr. Oliver, &c.), and therefore it is unnecessary to enter on their history here. From Domesday Book we find that Tiwardrai Manor was given by William the Conqueror to Robert Earl of Moreton. It had been held by Colo in the days of Edward the Confessor. Robert Fitzwilliam (temp. Ed. III), is said to have been buried at Tywardreath, and there are old Monuments relating to members of the Rashleigh family.

It is stated that the church was rebuilt in 1347, and it was much renovated in 1880. Carew states that Master Rashleigh the Elder came from Devon and settled at Menabilly, in 1585. In the mansion, at the present day, are preserved many family portraits and other objects of great interest.

After the visitors had been driven in the carriages to a suitable point of access, under the guidance of Mr. Enys and Mr. Evelyn Rashleigh, a detour was made to inspect Castle-Dôr, an ancient British fortification, very perfect in its circular form, the ramparts of which command magnificent views of valleys and hills. The panorama extends to places at a distance of over 30 miles. The Dunstanville monument on Carn Brea, near Redruth, was visible westward to those present (at a distance of about 28 miles as the crow flies). With regard to Castle-Dôr,—the battle-ground of the Celts became identified, at a later period, with the events of the Parliamentary Civil War—King Charles I is reported to have slept at a neighbouring farm, on a night preceding one of his battles.

Re-entering the carriages the excursionists next proceeded past the Bishop's new lodge at Trenythen, to "the Long Stone,"—a Romano-British memorial of great interest in the centre of the highway outside Menabilly Lodge gates. This spot, according to the late Dr. Borlase, seems to have been its original site—but for many years, down to a recent date, it stood beside the road at New-town. Dr. Borlase, in 1754, figured and described the stone. Quoting Lluyd, he rightly gave the

Inscription as :—*CIRVSIVS HIC IACIT CYNOWORI FILIVS*. He added "the same learned person (Lluyd) justly thinks the *w* to be an *m* reversed, the *w* [in the form now in use] being but lately (about A.D. 1200) introduced into any alphabet." Mr. Jonathan Rashleigh deserves the thanks of Archæologists for having had the stone well set up, on lofty steps, in its present excellent position. Its date has been assigned to the period of centuries extending from the 4th to the 7th. In its summit is a socket, and at the top of the back of the stone is a cross in relief, either a "tau"—cross, or a mutilated cross which once was more complete. The Rev. W. Iago described the stone and its legend, to those present, and remarked that a broad-arrow, the "bench-mark" of the Ordnance Survey, was cut in recent years upon the stone. A protest having been sent to head-quarters, the men were forbidden to cut the broad-arrow on Antiquarian remains in future.

Fowey was next reached, and some of the party crossed Bodinnick Ferry, for the purpose of seeing Hall Walk, which commands a beautiful view of the harbour, and on which King Charles I, it is said, was walking in 1646, when he was fired at. It forms part of the grounds of the old mansion in which he stayed; at the present time a farm-house marks the site, and the fine chapel is used as a barn. The property belongs to the family of Howell of Ethy, and is in the parish of Lanteglos-by-Fowey.

Other members of the party, including the Mayor of Bodmin, visited Polruan, with its ancient cross and the ruins of St. Saviour's Chapel. In the precincts of this latter there was found many years ago, a leaden "bulla," which had been the seal of a Papal "Bull," and is now deposited in the Royal Institution Museum, at Truro. It bears, in Lombardic capitals, the legends :—"URBANUS, PP VI," with small figures of eagles below, on one side,—and "s[anctus] PA[ULUS]. s[anctus] PE[TRUS]." with the Apostles' faces and a crozier, on the other. Urban the 6th was Pope from 1378 to 1389. (For such "Bullæ Paparum" see Astle, p. 158, tab. xxviii.) St. Saviour's tower is stated to have fallen in 1825.

In going down the harbour, from Bodinnick, Mr. E. Rashleigh pointed out the vessel "Mary Ann," an old smuggler

with a startling record, now used to support a crane for the neighbouring wharf.

Landing at the Town Quay, the visitors inspected Fowey Church (dedicated to St. Fimbar). The Vicar, Rev. H. N. Purcell, explained the principal features of the edifice. Mr. A. Q. Couch, a native of Bodmin, a well-known modern writer ("Q"), resident at Fowey, also joined the party by invitation.

Luncheon was held in the ancient hostelry "The Ship" Hotel, formerly the mansion of the Rashleighs. Initials, and portraits in relief, still adorn the old house.

Place House, the ancient and beautiful residence of the family of Treffry, was also reached, and the Porphyry Hall inspected by permission, after which the carriages took the members of the expedition to Menabilly. Mr. and Mrs. Jonathan Rashleigh there received all most cordially, and the former accompanied his guests through the extensive grounds, indicating, to those interested, the rare shrubs, trees, etc., which were flourishing, as if in a tropical climate.

With Mr. Rashleigh all next proceeded to the famous Menabilly Grotto,—just above Pridmouth beach, a very lovely spot. The grotto was erected by the late Mr. Philip Rashleigh, between 1750 and 1760. The minerals were brought from various parts of the world, and are most skilfully arranged. The late Duke of Devonshire, taking this grotto as his model, erected one, similar in many respects but smaller, at Chatsworth. The late Duke of Bedford also copied it, to some extent, in a smaller one which he made at Endsleigh. In neither of these, however, were they able to reproduce the beautiful asbestos roof hung with stalactites which appears in that of Menabilly. Mr. and Mrs. Rashleigh having entertained the visitors at Tea in a large tent at Pridmouth, the President (Mr. J. D. Enys), expressed the thanks of all present, to Mr. and Mrs. Rashleigh for their kind reception. Mr. Evelyn Rashleigh was also thanked for having acted usefully as guide, at various points of the route during the day. On the return journey, a passing visit to Tregaminion Chapel was also paid, by those who had a little time at their disposal,

The success of the Excursion was due, in a great measure, to the excellent care and arrangements of Major Parkyn, F.G.S., Hon. Sec., whose efforts received hearty and well-merited acknowledgements. Mr. Gregg, the Curator, also rendered valuable services, and nothing marred the pleasure of the day.

Royal Institution of Cornwall.

ANNUAL AUTUMN MEETING, 1894.

On Tuesday, the 27th of November, the 76th Annual Meeting of the Society was held in its rooms at the Museum Buildings, Truro. There was a large attendance. The President, Mr. John Davies Enys, F.G.S., occupied the Chair, and there were also present, the Mayor of Truro (Mr. S. Trevail, F.R.I.B.A.), the Archdeacon of Cornwall (Ven. J. R. Cornish, M.A.), the Revs. the Rector of Truro (Sub-Dean Bourke, M.A.), Canon A. P. Moor, M.A., F.R.G.S., Canon J. H. Moore, M.A., W. Iago, B.A., C. F. Mermagan, B.A., C. F. Rogers, M.A., and D. G. Whitley; Dr. Rigg, ex-President of the Wesleyan Conference; Col. G. J. Smith, Major Sharp, Major Parkyn, F.G.S. (Hon. Sec.); Messrs. C. Davies Gilbert, G. B. Millett, M.R.C.S.; N. E. Norway, M.R.C.S.; Howard Fox, F.G.S.; R. Fox, J. G. Chilcott, E. A. Wünsch, F.G.S., E. Kitto, F.R.Met.Soc., R. V. Tellam, J. Henderson, A. Blenkinsop, W. Clyma, R. Renfree, F. Cozens, Tregoning, Davey, Barrett, Paull, Hamilton James, Dorrington, Letcher, Jones, and others, and many ladies, including Mesdames Tomlinson, Rogers, Smith, Norway, Dixon, Cornish, Moore, Paul, Kitto, and the Misses Tomn, Barham, Paull, Smith, Dixon, Clyma, &c.

Major Parkyn, Secretary, read the 76th Annual Report, which was of a highly satisfactory character, and will be found at a subsequent page of this Journal.

Mr. Robert Fox proposed its adoption, and hoped the County would continue to give its support to the Institution, and that "one and all" would do their utmost to promote its interest. Mr. Millett seconded, and the resolution was carried unanimously.

A list of Presents to the Library and Museum was also read, and will be found appended.

The President gave an account of his observations on the effect upon vegetation, &c., of the dry summer of 1893, and the wet summer of 1894, and of the intermediate frost.

He also referred to two coins found in different parts of the county. One, at Carn Breâ, identified by the British Museum Authorities as a bronze coin of Micipsa (King of Numidia, a Phœnician colony) who reigned before the commencement of the Christian era, the other an English coin, of King Stephen, who reigned A.D. 1135-54.

Mr. Howard Fox, F.G.S., read some notes on tin-stone, contributed by Mr. J. H. Collins, F.G.S., the Society's geological gold medalist.

The Rev. D. G. Whitley read a paper sent by Mr. Davey of Ponsanooth on "Plant Distribution," on which an interesting discussion took place.

Mr. R. V. Tellam, of Bodmin, exhibited and described some remarkable geological formations found in slate in the Railway cutting at Treworder Wood, near Wadebridge, having the appearance of fossil fish, but considered to be compressed nodules of stone. He presented several good specimens to the Museum, for which the thanks of the Society have been accorded to him.

Mr. E. A. Wunsch, F.G.S., spoke on the subject of books, suitable for additions to the Library, which had been purchased with part of Miss Curgenvin's legacy, and which, being of a modern character, would be found especially useful.

Mr. R. N. Worth, F.G.S., forwarded a continuation of his paper on "The Rude Stone Monuments of Cornwall" as a contribution to this Journal.

Sir John Maclean, F.R.S.A., ex-President of the Institution, in anticipation of not being able to attend the Meeting, had sent a paper on "The Tenure of Old Manors in Cornwall."

The Rev. W. Iago, B.A., exhibited an enlarged drawing of a very minute Venetian coin found in Bodmin. He also showed the coin itself, and gave an account of the legends relating to

St. Mark and the Doge of Venice, and the curious traditions attaching to them.

The Mayor of Truro proposed a vote of thanks to contributors of papers, and donors of gifts to the Institution, Col. G. J. Smith seconded.

Mr. C. Davies-Gilbert likewise proposed thanks to the chairman for presiding, and Archdeacon Cornish seconded.

These resolutions were carried unanimously.

ANNUAL REPORT.

The Council, in presenting their 76th Annual Report, have pleasure in being able to again announce the continued prosperity of the Society. The number of gifts to the Museum and Library show no diminution and have been sent by friends of the Institution from almost every quarter of the world, plainly proving the great interest maintained in the Society.

It is with regret that the deaths of several valued members have to be recorded. Mr. W. H. Tregellas is well-known to all the readers of the Journal for the very valuable papers he from time to time contributed. His very interesting sketch of the old Truro Grammar School may be specially mentioned—a paper much appreciated and read by a large number of persons besides the members of the Society. He showed great personal interest in the welfare of the Institution and never failed to visit it when he came into Cornwall for his holidays.

In Mr. Pengelly, F.R.S., the Society lost a very distinguished member, whose many contributions to the earlier numbers of the Journal, added much to its value and interest.

In Dr. Rundle was lost one well-known to almost every member of the Society, whose valuable assistance in re-arranging many of the objects in the Natural History cases in the Museum, and whose many gifts, greatly enhanced the value of the collections.

It is with great regret that the Society misses his familiar face and voice in these rooms.

Mr. H. Seymour Tremeneheere might be said to have been a life-long subscriber. He was always eager for the appearance of the Journal in which he evinced the greatest interest.

The death of Mr. Edward Coode, of Polapit-Tamar, is also greatly to be regretted.

The library continues to be periodically enriched by the valuable publications of kindred societies which are acquired by exchange. Canon Moor, one of the Vice-Presidents has since the last meeting presented a long series of the Proceedings of the Royal Geographical Society, together with the works of Sir William Jones. The many gifts of the President are noticed under the accounts of the Museum, and the names of several other donors of books will be found in the list of additions to the library. The portrait of Mr. John Tabois Tregellas, the author of so many tales characteristic of Cornish life and scenes, was bequeathed to the Society by his talented son, Mr. Walter H. Tregellas, whose death we all so much deplore. A framed set of Old Signs or Marks of the principal Mercantile Firms of Cornwall from 1800 to 1820 presented by Mr. A. P. Nix, the Hon. Treasurer, on behalf of Messrs. Willyams, Willyams, & Co., late Miners' Bank, is of very great interest.

A considerable sum has been expended in binding the various publications. It may here be mentioned that a recent addition to the library has been made by the purchase of many standard scientific works.

The great increase in the number of books presented to the Society, particularly the numerous and valuable collection from the library of the late Mr. H. M. Jeffery, F.R.S., for which we are indebted to the late Miss Curgenvén of Falmouth, mainly through the kind offices of Mr. F. Nalder, her solicitor, has necessitated the compiling of a new catalogue and the providing of a series of new book-cases. The efficiency of the library will be greatly increased when the new catalogue, now in course of compilation, is completed.

We are pleased to be able to announce that the next number of the Journal will shortly be in the hands of the subscribers.

During the year, valuable additions have been made to the Museum, among which the following may be particularly noted. A collection of 12 Roman coins, ranging from Gallienus to

Constantine the Great, which were ploughed up in a field at Pennance, Budock, in February, 1865, presented by Mr. J. D. Mitchell of the Manor Office, Falmouth. A valuable collection of minerals, rocks, and precipitates, with full details as to their composition, presented by Mr. J. Osborne, who is also a liberal donor of objects of scientific and antiquarian interest. A fine collection of articles from the Malay Peninsula sent by Capt. J. Roberts of the Silensing Mines, Pahang, supplements the collection given by him last year. Dr. Richard Pearce of Denver, Colorado, sends some fine specimens of wood tin and tinstone from Durango, Mexico, one of which appears to be unique in its formation. Mr. Howard Fox has presented a collection of fossils from the Trevone neighbourhood. Mrs. Sharp, of London, a frequent donor to the Museum, has sent a box of interesting curios. Mr. J. D. Enys, our much esteemed President, with his accustomed and apparently unbounded liberality has presented a number of valuable scientific works to the library, together with portraits of Professors Huxley and Tyndall, and a number of interesting articles for the Museum. He has further made the collection of meteorological instruments much more complete, by his gift of the Jordan Sunshine Recorder.

The interest of the public in the Museum is well sustained, and it is gratifying to be able to announce that a much larger number of persons paid for admission than in any previous year. This, however, may be partly accounted for by the Fisheries Exhibition, which was held in the city in July and August, and caused such an influx of strangers into the county.

The numbers were :—

Admitted free	2,402
Members and friends ..	269
By payment	624
<hr/>	
Total	3,295

Classes held last session under the auspices of the Institution, were attended by over 60 students, the majority of whom presented themselves for examination under the Science and Art Department, with the following very gratifying results:—

Honours stage	..	2	successes.
Advanced	„	16	„
Elementary	„	54	„
<hr/>			
Total	..	72	

These results indicate steady growth, and prove the value of systematic courses such as are provided by the Institution classes.

During the present session 12 classes are being held, and are very fairly intended. Numerous visits have been paid to the mineral and geological collections by many of the students, who have derived great benefit therefrom.

The success of Reginald J. Greenaway, one of the students, is especially worthy of mention, he having earned no less than 7 certificates at the late examinations, viz.: 1 in the honours, 3 in the advanced, and 3 in the elementary stages.

The meteorological observations have been recorded with the accustomed regularity, and the results forwarded to the Registrar-General, the Sanitary Committee of the Cornwall County Council, and the local papers. The Jordan's Photographic Sunshine Recorder, presented to the Institution by our President, Mr. J. D. Enys, as already stated, has enabled us to make the series of observations taken by us more complete, and, since it has been in position, it has been a source of great interest to many of our members and friends.

In the Museum, the work of arranging the minerals has been continued. The fossils have been placed together in their order of sequence, and a start has been made towards classifying the fine collection of minerals presented by Mr. J. C. Williams, M.P., last year. The collection of minerals and precipitates from Rio Tinto, given by Mr. J. Osborne, F.G.S., of the Rio Tinto Mines, which is of extreme value to the metallurgical student, has been classified and arranged in a case by itself in the geological room. In the other rooms the cases have been cleaned, and their contents attended to, while some of them have been painted, and made more fit for the display of the objects placed in them. A large number of the specimens have been re-labelled, many of the old labels having become almost illegible.

GIFTS TO THE LIBRARY.

Abridgements of Specifications	Patent Office, London
The Age of the Saints	Mr. Joseph Pollard.
Address by the Marquis of Bute. Written for the Rhyl Eistedfodd	Cymmrodorion Society
Ruthvin Court Rolls	
Industries of Cornwall	
Eastbourne Natural History Society, President's Address	Messrs. C. Barrett Son.
Official Catalogue of the Cornwall Fisheries' Exhibition 2nd edition	Mr. H. Michell Whitley F.G.S.
New South Wales : Statistics, History, and Resources, 1894	Mr. E. W. Rashleigh.
Original Letters of Sir Bevil Grenville Kt.	Agent General for New South Wales.
Photographs of the Cornish Lord Mayor, Sir Isaac Pennington, temp. Charles I	Mr. St. David M. Kemys-Tynte.
Manual of Geology. Jukes... ..	Mr. Thurstan C. Peter
Lyell's Principles of Geology, 2 vols.	
Lyell's Elements of Geology	
Geology of Oxford and the Thames Valley. Phillips...	
Manual of Geology. Phillips.	
Text Book of Geology. A. Geikie... ..	
Faraday before a Juvenile Audience	
Remarks on the Intensity and Quantity of the Junction Changes of Sussex and Cornwall, by J. S. Enys, 1863 ..	
Index to the Reports and Transactions of the British Association from 1831 to 1860 and from 1861 to 1890	
Report of the British Association, 1893	
Dr. Mantell's Wonders of Geology	
Treasury of Botany. Lindley and Moore	
Spectrum Analysis. Roscoe.	Mr. J. D. Enys, F.G.S.
Island Life. Wallace	
Ancient Bronze Implements of Great Britain. Evans	
Freaks and Marvels of Plant Life. Cooke	
Mental Physiology. Carpenter	
Our Social Bees. Wynter	
Six months in Ascension. Gill... ..	
Ants, Bees, and Wasps. Lubbock	
Sound. Tyndall	
Magnetic Survey of the British Isles. Sabine	
British Association Report, Bath, 1864	
Tabular View of Characteristic Fossils	
Lay Sermons and Addresses. Huxley	

The Mode of occurrence of Gold in the Ores of the Cripple Creek District	}	Dr. Richard Pearce.
13 Volumes Sir William Jones's Works		
4 Volumes and 4 Numbers Archæological Journal	}	Rev. Canon Moor.
Proceedings Royal Geographical Society... ..		
Histories of American Schools for the Deaf, 1817-93. Vols. I, II, and III	}	Volta Bureau, U.S.A.
South Australian School of Mines Annual Report, 1893		
The Typal use of the 22 Letters of the Hebrew Alphabet	}	Mr. Edward Dingle, Tavistock.
The Square of the Circle		
The Mackerel... ..	}	Mr. Matthias Dunn.
Remarks on the Devon and Cornwall Fisheries		
Heaven and Hell	}	The Swedenborg Society.
Divine Providence... ..		
True Christian Religion		
Apocalypse Revealed		
Compendium of Swedenborg's Theological Writings		
An Appeal on behalf of Swedenborg and his Writings		
Divine Love and Wisdom		
Outlines of Swedenborg's Theology and Philosophy		
Manual of New Church Doctrine		
Swedenborg: A Biographical Sketch		
The Economic Treatment of Low-grade Copper Ores	}	Mr. J.H.Collins, F.G.S.
M.S. of the Disbursements to the Poor of Callington, 1747		
Meteorological Reports: Falmouth Observatory	}	Mr. W. L. Fox.
Picturesque Devonshire and Cornwall		
Greenwich Observations, 1891	}	The Lords Commissioners of the Admiralty.
Greenwich 5 year Catalogue, Epoch 1890		
Cape Heliometer Observations, 1881-3		
Southport Meteorological Observations	}	Mr. Joseph Baxendell.
A Tabula de Bronze de Aljustral, Lida Deduzida e Commentada E.M., 1876		
Report (under the Metalliferous Mines &c. Act), for North Wales, Isle of Man, &c.	}	Mr. James Osborne, F.G.S.
Orient Line Guide... ..		
		Prof. C. Le Neve Foster, D. Sc.
		Messrs. Street & Co.

GIFTS TO THE MUSEUM.

Specimen of Quartz Crystals	}	Capt.Provis, Camborne
Pair of Snow Shoes		
Pompeiiian Vases (7)		
Tear Bottle from Pompeii		
		Miss Mary Sophie Tucker daughter of the late Admiral Tucker.

Portrait of Prof. Huxley	} Mr. J. D. Enys, F.G.S
Portrait of Prof. Tyndal	
Case of Crossbills	
Case of Buntings	
The Tropic Bird	
Stones worn by Blown Sand from New Zealand	
6 Medallions in Plaster	
Jordan's Photographic Sunshine Recorder	
Boomerang from Australia... ..	
Wasps' Nests	} Capt. Hambley, Redruth.
Specimen of Tin Stone from Bolivia... ..	
12 Roman Coins ploughed up in a field at Pennance, Budock, in February, 1865	} Mr. J. D. Mitchell, Falmouth.
2 Eggs of the African (Congo River) Gray Parrot, laid in England	
Hen's Egg containing a second complete Egg in its interior	} Mr. Sam. Harris, Truro.
Collections of Minerals, Rocks, and Precipitates, from the Rio Tinto Mines, Spain... ..	
Set of Photographs of the Rio Tinto Mines	} Mr. James Osborne, F.G.S.
Roman Miner's Pick from Rio Tinto	
White Metal from a Roman Slagheap, Rio Tinto... ..	
Metallic Copper found in Slag in the bottom of a Roman Furnace, Rio Tinto	
Portions of Utensils or Ornaments, made of Hard-head, from Roman Slagheaps, Rio Tinto	
3 Fossils from Rio Tinto	
Alluvial Tin from Salamanca	
Specimen of Pyrites (Reniform)... ..	
Stone Pestle, supposed by the Authorities of the British Museum to have been used by the Ancients to grind pigments for adorning their persons... ..	
2 Stone Implements from Rio Tinto... ..	
Cores of Rock from Diamond Boring Machine	} Capt. James Roberts, Silensing, Pehang.
Chinese Counting Board	
Elephant's Tusk	
Elephant's Teeth	
Malay Pottery	
Malay Ricebag	
Hornbill	} Dr. Richard Pearce.
Specimens of Auriferous Quartz from the Silensing Mines	
Specimens of Wood Tin from Mina del Diablo, Durango Section and Sketch of Tin-stone from Durango	
	Mr. J. H. Collins, F. G. S.

Specimen of Adinole from Dinas Head	}	Mr. Howard Fox, F.G.S.
Specimen of Grey Nodular Spherulitic Rock from Dinas Head		
Fossils :—Anarcestes (2), Orthoceras and Goniatices, Cardiola Restrostriata (2), Fucoids, Crinoidal Fragments of Tornoceras Simplex, Pachypora Sp., Mimoceras Compressus, Tentaculites, Goniatices Noeggerathi and Bactrites from Trevone		
Conularia, Goniatices Sp., Cardiola Restrostriata, Conularia Sp., from Constantine Bay		
Orthoceras, Tornoceras, and Tentaculites from South of Dinas Head		
Radiolarian Chert from the Culm Beds of Carzantick Quarry, Launceston		
Styliolæ from Trevone, identified by T. Rupert Jones, F.R.S.		
Crinoidal Remains from Gidley Well, Veryan ...		
Nodule from South of Dinas Head		
Sword, presented to the late Lieut. Mansell of the " Marlborough " Falmouth Packet	}	Miss Mansell, Falmouth.
Native Silver mounted as a Brooch		
Native Silver mounted as a Scarf Pin	}	Mr. T. L. Dorrington
Specimen of Native Silver		

Dr. Mr. A. P. Dix, Hon. Secy., in account with the Royal Institution of Cornwall. Cr.

1893.		£ s. d.		1894.		£ s. d.	
July 31st.	To Balance...	...	...	July 31st	By Curator ...	...	...
1894.		5	11			75	0
July 31st.	" Interest on Deposit Notes	...	...	"	Fire Insurance	...	...
	" H.R.H. Prince of Wales	...	...	"	Taxes	...	...
	" Subscriptions	...	...	"	Printing: Journal, &c.	...	...
	" Visitors' Fees	...	...	"	Fuel and Gas	...	...
	" Sale of Journals...	...	...	"	Repairs to Building, &c., and Renewals	...	...
	" Sundries	...	...	"	Museum Expenses	...	...
	" Legacy: Miss Curgenven	...	...	"	Magazines	...	...
				"	Caretaker	...	...
				"	Sundries	...	...
					Balance	...	...
						75	17
						12	16
						5	9
						5	18
						5	0
						11	15
						75	17
						£275	4
						8	

Summary of Meteorological Observations at Truro, in Lat. 50° 17' N., Long. 5° 4' W., for the year 1894, from Registers kept at the Royal Institution of Cornwall.

TABLE No. 1.

MONTHLY MEANS OF THE BAROMETER. Cistern 43 feet above mean sea level.																
1894.	Month.	Mean pressure corrected to 32 deg. Fahr. at sea level.			Mean force of vapour.	Mean pressure of dry air.	Corrected absolute maximum	Day.	Corrected absolute minimum	Day.	Extreme range for the month.	Mean diurnal range.	Greatest range from 9 a.m. to 3 p.m.	Day.	Greatest range in any 24 consecutive hours.	Between which days it occurred.
		9 a.m.	3 p.m.	9 p.m.												
		ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.	ins.
	January	29.873	29.832	29.831	.225	29.620	30.441	3	31	29.446	.165	20	.44	20	.54	3 & 4
	February	30.095	30.083	30.095	.254	29.839	30.494	3	11	29.468	.097	23	.35	23	.36	11 & 12
	March	29.978	29.951	29.971	.253	29.713	30.426	5	12	29.300	.111	12	.43	12	.54	5 & 6
	April	29.796	29.821	29.813	.298	29.512	30.198	30	16	29.342	.094	18	.22	18	.45	21 & 22
	May	29.962	29.954	29.975	.266	29.697	30.361	1	28	29.638	.066	13	.19	13	.48	11 & 12
	June	30.013	30.012	30.023	.379	29.637	30.261	26	6	29.600	.062	2	.20	2	.23	23 & 24
	July	29.885	29.888	29.891	.396	29.492	30.238	3	10	29.416	.061	11	.18	11	.42	9 & 10
	August	29.951	29.961	29.974	.424	29.538	30.233	29	2	29.603	.073	23	.26	23	.36	15 & 16
	September	30.109	30.099	30.119	.352	29.757	30.474	30	25	29.580	.064	26	.20	26	.37	25 & 26
	October	29.883	29.870	29.887	.323	29.557	30.446	1	24	29.062	.080	27	.26	27	.74	23 & 24
	November	29.932	29.917	29.944	.297	29.634	30.493	30	12	28.843	.096	15	.26	15	.70	13 & 14
	December	30.037	30.068	30.057	.275	29.995	30.744	27	30	29.630	.112	28	.56	28	.71	27 & 28
	Means	29.963	29.954	29.965	.311	29.665	30.400			29.410	.085		.295		.491	

REMARKS.—The Barometer used is a Standard, made by Barrow, and compared with the Standard Barometer at the Royal Observatory, Greenwich, by Mr. Glashier. The corrections for Index Error (+0.008), Capillarity (+0.108), height above sea (43 feet), and temperature, have been applied.

TABLE No. 2.

MONTHLY MEANS OF THE THERMOMETER																										
1894.		MASON'S HYGROMETER.						SELF REGISTERING.						ABSOLUTE.												
		9 a.m.		3 p.m.		9 p.m.		Mean of Dry Bulb.	True mean of Dry Bulb.	Mean of Wet Bulb.	Mean correction for diurnal range.	Mean temp. of evaporation.	Wet Therm. below dry.	Mean dew point.	Dew point below Dry Therm.	Mean of all the Maxima.	Mean of all the Minima.	Approximate mean temp.	Correction for the month.	Adopted mean temp.	Daily mean range.	Maximum.	Day.	Minimum.	Day.	Range.
Month.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.	Dry Bulb.	Wet Bulb.
January	41.1	39.4	44.1	42.0	42.2	40.8	42.5	42.1	40.7	0.3	40.4	1.7	37.5	4.6	46.7	36.6	41.6	0.1	41.5	10.0	55	11	10	7	45	
February	44.9	42.8	48.4	45.1	43.9	42.6	45.7	45.0	43.5	0.5	43.0	2.0	40.7	4.3	50.5	39.8	45.1	0.1	45.0	10.7	56	26	24	21	32	
March	47.7	44.3	51.5	46.7	43.5	41.3	47.5	46.5	44.1	0.6	43.5	3.0	40.6	5.9	58.6	37.0	45.9	0.2	45.7	9.8	66	27	29	3	37	
April	52.6	48.8	52.2	50.3	48.1	46.5	51.9	50.3	48.5	1.3	47.2	3.1	44.9	5.4	58.6	42.5	50.5	0.1	50.4	16.1	67	1	30	13	37	
May	52.8	47.9	54.7	49.0	48.5	46.4	52.0	49.7	47.7	1.4	46.3	3.4	41.9	7.8	58.4	44.0	51.2	0.8	50.4	14.4	72	18	34	22	38	
June	59.7	55.6	61.6	56.7	55.6	53.4	58.9	56.0	55.2	1.7	53.5	2.5	51.4	4.6	65.0	50.9	57.9	0.3	57.6	14.1	80	30	41	1	39	
July	61.7	57.2	63.0	57.6	57.4	55.6	60.7	58.6	56.8	1.2	55.6	3.0	52.5	6.1	66.0	53.8	60.4	0.3	60.1	13.0	75	6	43	14	32	
August	61.1	57.2	63.6	58.3	57.3	55.9	60.6	58.6	57.1	1.2	55.9	2.7	54.4	4.2	66.7	54.1	60.4	0.3	60.1	12.6	81	31	44	17	37	
September	58.0	54.6	61.6	55.8	52.5	51.1	57.3	55.6	53.8	0.9	52.9	2.7	49.3	6.3	65.2	46.5	55.9	0.2	55.7	18.7	73	2	33	30	40	
October	53.4	50.4	56.2	52.2	50.0	48.7	53.2	52.4	50.4	0.6	49.8	2.6	47.0	5.4	60.3	44.1	52.2	0.4	51.8	16.1	70	11	31	18	39	
November	48.6	46.9	50.8	48.3	46.8	46.8	49.2	48.6	47.3	0.5	46.8	2.8	44.8	2.8	53.9	42.6	48.2	0.1	48.1	11.3	60	3	32	21	29	
December	46.2	44.1	48.5	46.1	46.5	45.0	47.0	46.8	45.0	0.3	44.7	2.1	42.8	4.0	50.5	41.9	46.1	0.2	45.9	8.6	56	13	28	4	28	
Means	52.3	49.1	54.6	50.6	49.4	47.8	52.2	50.8	49.1	0.9	48.3	2.6	45.6	5.1	58.0	44.4	51.2	0.3	51.0	12.9	67		31		36	

The Thermometers are placed on the leaded roof of the Royal Institution in a wooden shed, through which the air passes freely. The Standard Wet and Dry Bulbs are by Negretti and Zambra, and have been corrected by Mr Glaisher.

TABLE No. 3.

WINDS.

1894.

Month.	E.	S.E.	S.	S.W.	W.	N.W.	N.	N.E.	AVERAGE FORCE.																			
	ave	g	6		ave	g	6		ave	g	6	ave	g	6	ave	g	6	ave	g	6	Mean.							
January	1	—	—	1	3	2	2	2	9	11	13	4	3	—	2	5	7	1	1	—	4	4	1	1·2	1·4	1·3	1·3	
February	1	2	2	1	1	—	2	2	1	12	12	14	1	5	2	5	4	—	4	1	1	—	—	—	1·1	1·3	0·9	
March	10	8	4	2	3	2	—	1	—	6	5	6	4	6	3	4	5	3	1	2	1	1	—	2	1·1	1·0	0·8	
April	1	1	1	11	9	7	3	5	4	5	5	2	2	3	2	1	2	2	4	3	3	1	2	3	1·3	1·3	0·8	
May	1	1	1	2	2	1	—	1	1	5	5	5	3	4	4	8	9	6	6	5	4	5	4	—	—	1·1	1·2	0·7
June	4	3	2	2	4	—	3	1	—	9	7	7	2	4	4	5	9	9	2	2	1	2	—	—	—	1·2	1·1	0·8
July	2	2	2	6	6	2	3	2	3	7	5	2	3	6	4	8	7	7	—	1	1	1	2	1	1·1	1·2	0·7	
August	1	2	—	—	1	1	—	2	1	3	5	1	10	8	10	7	9	5	3	3	2	2	—	—	—	1·1	1·3	0·7
September	8	4	2	2	6	1	—	1	1	1	—	1	2	—	1	2	2	8	9	9	6	2	1	1·1	1·0	0·5	0·8	
October	4	3	1	—	3	1	4	3	3	6	6	5	1	3	3	—	—	—	2	4	2	5	5	3	1·0	1·2	0·7	
November	1	1	1	1	1	1	4	5	4	8	7	9	2	5	1	3	3	3	—	1	—	4	6	2	1·0	1·1	0·9	
December	2	2	—	1	2	2	2	3	3	4	5	4	3	3	3	8	6	7	3	6	2	—	—	1	1·1	1·3	0·9	
Total	36	29	16	29	41	20	23	28	23	75	73	68	36	52	36	52	61	51	34	38	26	32	25	17	13·4	14·4	9·7	
Means	27·0			30·0			24·6			72·0			41·3			54·6			32·6			24·6			1·1	1·2	0·8	

The force of the Wind is estimated on a scale from 0 to 6, from calm to violent storm.

ON SOME FORMS OF LAND TENURE AND THE HISTORICAL ILLUSTRATIONS AFFORDED BY THEM.

By the late SIR JOHN MACLEAN, Kt., F.S.A., F.R.S.A., &c.

V.P. and Past President, Royal Institution of Cornwall.

Feoda, Feuds, Fiefs, or Fees are of great antiquity. Their origin is involved in obscurity, and has been a subject of much speculation and contention. They formed an element of the Feudal system, which prevailed in its most complete and distinctive form among the Teutonic tribes, and was, probably introduced by them into Europe from their native northern forests. Under the German organization every free man was the possessor of land. He had assigned to him an Alod or Edél which he held absolutely, and having no superior lord, rendered no service except in acting conjointly with his fellow freemen in defence of their common possessions, rights, and privileges. He was, however, free from the burdens incidental to the holding of a Fief. An alod differed from a Fee in this respect: the latter was merely a loan or benefice, and the person to whom it was granted did not become its owner, but only its tenant, or holder, subject to the performance of certain services to the grantor. In case of default in the execution of these conditions, or upon the expiration of the term for which the grant was made,—and the estate was never more than a life interest,—the land reverted to the original owner.

There is now no such thing as an alod in this country. The greatest estate is an estate in Fee-simple, and this is based upon the feudal principle. If a man possessing an estate in fee dies without heirs, and without bequeathing it by will, it escheats or falls back to the lord, and if there be no intermediate lord, to the king.

Some writers have attempted to trace the principles of Fees to a much earlier date than the overthrow by the Germanic tribes of the Roman Empire, and fancy they see a close analogy between the relations of a lord and his vassals under the feudal

system, and those of patron and client under the Roman Republic. The latter, however, differed widely from the former, in that they were not based upon the tenure of land.

It is not our intention to enter into this subject at any length, but inasmuch as the feudal system, some twelve centuries or more ago, obtained throughout Europe to so great an extent as to lead Sir Henry Spelman to describe it as "the law of nations in this our western world," we are desirous of placing before the reader a few general remarks upon the subject of Fees, before attempting to describe those of Cornwall.

Fees originated in the right of Conquest, under which, it was supposed, the whole land of the acquired territory became the property of the successful Chieftain or Sovereign, who allotted large portions to his principal followers on the condition that the possessors should do faithful service to the grantor, both in peace and war; and, in respect to the latter, that he should attend his lord to the field with a certain stipulated force proportionate to the grant which he had received. The chieftains allotted portions to their immediate dependents under similar conditions, who stood in the same relation to their lords as the latter did to the King. These fees were entirely based upon military service, and it has been thought, that in the earlier period of the system, the vassal was obliged to attend his lord in war for any length of time his services might be required. However this may have been, from the time at which we take up the subject the period of service had become fixed, by law or usage, to forty days at a time for such Knight's fee, 20 days for half a fee, and so on in proportion.

The grant of land as a Fief, especially when it was a grant from a Suzerain, or supreme lord, was often accompanied by extensive jurisdictions, though their exercise was somewhat restrained by the Hundred and County Courts. Every tenant in capite possessed jurisdiction, both civil and criminal, over his immediate tenants. He held his Courts and administered his laws within his Lordship, in many cases extending even to life and death, like a Sovereign Prince. And at these Courts, held frequently, all his tenants were obliged to attend, and do suit and service, under pain of amercement.

Other duties of a vassal to his lord were wholly of an honourable character. The vassal was bound to his lord in fealty, and it was a breach of faith to divulge the lord's counsel, or to conceal from him the machinations of his enemies; to injure his person, or fortune or to violate the sanctity of his roof or the honour of his family. In battle the vassal was bound to lend his horse to his lord when dismounted, to adhere to his side when fighting, and to go into captivity for him when taken prisoner.

There were also many other substantial advantages which accrued to the lord. First among them, we may mention the right of Lords over their vassals in respect to the wardship and marriage of heirs being minors. As fees were held upon the condition of the performance of certain services which men only could render, in the event of the death of the tenant leaving a female heir, or a son within age, the lands were seized into the lord's hands, who became the guardian of the heir during his, or her, minority, and the lord, during that time, appropriated to himself the profits of the estate, subject to proper provision for the maintenance and education of the heir according to his degree. It involved also the right of tendering to the heir, being a female, whilst under age, a suitable husband, which if she refused, she forfeited the value of her marriage, which was as much as any one would give the lord for his permission to marry her. At a later date, the claim of marriage was extended to male heirs, being minors, and even to female vassals of all ages, and to widows who held lands in capite in dower. These rights, however, were exceptional, and were limited to this country, and, consequently, were the cause of much discontent and ill feeling. Attempts were several times made to restrain the power, but without success. Upon reflection, however, it would not seem to be a claim inconsistent with feudal principles. The land being held by services which women and children could not perform, it would appear to be only reasonable that the lord should be satisfied as to the sufficiency of the substitute, and that to enable him to provide for the service during the incapacity of the heir, he should retain the profits of the fief, which formed the endowment for the service. In addition to the right of wardship and marriage, and the advantages to the

lord incident thereto, there was the payment called the "Relief" which the lord claimed upon the admission of every new tenant to the possession of the fief. Moreover, in the event of the tenant dying without heirs, the land escheated to the lord; and it became forfeited in the event of the tenant being guilty of felony or breach of fealty. Besides all these advantages, there were the casual "Aids" which accrued to the lord from time to time, and which are of no small importance to us in this enquiry, inasmuch as their assessment forms one of the best clues to our knowledge of the Fees.

These aids, in later times, as regulated by Magna Carta, were levied for three purposes only, viz. :—to make the lord's eldest son a knight;—to marry his eldest daughter;—and to pay his ransom, if captured in war. In early times the king levied these aids by his own authority, but by statute of 24th Edward I it was ordained that the king should not levy any aid without the sanction of parliament.

The process of admission to fees was by homage, and fealty, and investiture. The first of these, Littleton says in his "Treatise on Tenure," is the most honourable service and the most humble service of reverence that a frank tenant may do to his lord, for when the tenant shall make homage to his lord he shall be ungirt and his head uncovered, and his lord shall sit and the tenant shall kneel before him on both his knees and hold his hands jointly together between the hands of his lord, and shall say thus: "I become your man from this day forward, of life and limb, and of earthly worship, and unto you shall be true and faithful and bear you faith for the tenements which I claim to hold of you, saving the faith which I owe to our sovereign lord the King," and then the lord so sitting shall kiss him. The reservation of faith to the king was an innovation known only in this country. But the leading principles of feuds and oath of fealty were due from the vassal to the lord of whom he immediately held his land, and to no other. Religious persons and women in making homage, instead of saying "I am your man," said "I do homage unto you." It will be observed that the act of homage did not enjoin any oath, but the service of *fealty* consisted

entirely of an oath Littleton writes, "When a freeholder (frank tenant), doth fealty to his lord, he shall hold his right hand upon a Book (the book of the Gospels), and shall say thus: 'Know ye this, my Lord, that I will be faithful and true unto you, and faith to you shall bear, for lands which I claim to hold of you, and that I shall lawfully do to you the customs and services which I ought to do at the terms assigned, so help me God and his Saints,' and he shall kiss the book; but he shall not kneel when he maketh his fealty, nor make such humble reverence as is aforesaid in homage."

Investiture, or the actual conveyance of Feudal lands, was of two kinds, proper and improper. Proper investiture was an actual putting into possession upon the ground, either by his lord or his deputy, for which in the case of the King a writ was usually directed to the Sheriff or escheator of the district which is called Livery of Seizen. The second method was symbolical, and consisted in giving a turf, a branch, a wand, or whatever else might be the local custom.

The above-mentioned solemn declaration and oath had a great moral effect, bound up as they were with the appearance of mutual interchange of benefits of bounty and protection on the part of the lord, and gratitude and service due on the part of the vassal, and so strong were these feelings during the period in which the spirit of the feudal system obtained, that the ties of natural relationship were regarded as of inferior obligation to the claims of fealty.

Long before the Norman Conquest, the alodial principle, upon which the lands in this country had to a considerable extent been originally held by the Saxons, had generally given way to the feudal, so that William did not altogether introduce a new principle, and, indeed, it was not until some time after the Conquest that the system of Fees and Military Service was definitely introduced.

The submission of the country to the Norman yoke was for a considerable period incomplete. At first, William possessed but a small portion of the lands of the kingdom, but forfeitures were constantly arising, and before the end of twenty years we find that nearly the whole area of the country had passed into

Norman hands. Domesday Book shews this. At all events, upon the establishment of the Feudal system, it was assumed that the whole of the lands were in the hands of the king, either as Royal Demesne, or held of him in Fee by vassals of the Crown, or by others under them. But from the beginning the vassals in this country would seem to have possessed an hereditary title to their fiefs, and consequently those feelings of gratitude and dependence to which we have alluded as animating the vassals of an earlier age and different country in their feelings towards their lords, did not exist in England in mediæval times; nevertheless a strong sense of honour, amounting almost to a religious principle, supplied its place, and this feeling was fostered by oaths and ceremonies.

We have, so far, been referring to Knight's service proper, which was to attend the King in his wars, but there was another species of tenure, of a free and honourable character, which we should briefly notice. This was the tenure of Grand Sergeanty. Under this tenure the tenant held in capite, but instead of serving the king generally in his wars, he was bound to do some honorary service to the king in person, viz.: to carry his banner or his sword, to hold his stirrup, to serve him with the cup at his coronation or the like. The manor of Cabillia, in Cornwall, was held in grand seargeanty by the service of meeting the King at Poulstone Bridge, on his coming into Cornwall, and attending him with a grey cape.

In most other respects this service was like knight's service, though the tenant was not bound to pay aid or escuage, and when the tenant by knight's service paid 100^s for a relief on every knight's fee, the tenant in grand sergeanty paid one year's value of his land.

England is said to have been divided into about 60,000 knights' fees, but of the exact number created by William in Cornwall we have no accurate knowledge. Few of them, however, were held in capite, as we shall see as we proceed. Upon his brother, Robert Earl of Moreton, the Conqueror bestowed 248 manors in the county. These Fees, for centuries afterwards, continued to be designated as Fees of Moreton, and being small fees, they were assessed to Aids, &c., at a lower

rate than the large fees. In the reign of Henry II, Reginald Earl of Cornwall held 215 Knights' fees in Cornwall and Devon. These fees, and all others which were created before the reign of Henry I, were called fees of the old ffeoffment, and those which were subsequently granted were designated as of the new ffeoffment.

We have seen that vassals were under the obligation of attending their lords to the wars whenever summoned to do so, but, from various causes, their actual personal attendance had at an early date, to a considerable extent, fallen into disuse. Personal attendance was required most strictly, if not solely from tenants holding by Knight's service "*in capite ut de Corona*" We find upon the Rolls of Parliament numerous summonses to such persons to appear at a certain rendezvous with horses and arms according to the number of their fees, &c., on a given day, to proceed with the king on a specified expedition. If a man, however, held his lands of the king by knight's service as of an honour then being in the king's hands, and not as of the Crown, such a tenant was permitted to send a Knight as a substitute, or to compound for the service by the payment of a sum of money assessed entirely upon such Knight's fees and parts of fees, which produced a fund enabling the king to subsidise an army of mercenaries. This payment was called Escuage, Scutage, or Scutagium, and it was not chargeable upon lands held in frank almoigne or socage. But it must not be understood that the term scutage was strictly limited to payments made for default of attendance with the army; in early times it had a wider signification, and applied to any payments assessed upon knight's fees, whether such payment had reference to the army or not:—for instance, the aid for the ransom of King Richard I, is called "*scutagium ad redemptionem Regis*."

From the time of the Conquest until nearly the end of the reign of King John, all the tenants holding of the King in capite were summoned to the Great Council of the Nation. The learned Selden believed all such tenants to have been of equal rank, and thought that the holding even of a single Knight's fee in chief constituted a Barony, and entitled the tenant to a writ of summons. Maddox, however, an equal authority, took

a different view, and considered that Baronies, from the beginning, differed from mere Knight service, and that it was only in a very restricted sense that persons holding of the King simply by that tenure could be regarded as Barons. We accept the opinion of the latter authority, and conceive that from the beginning there must have existed among the tenants of the Crown, a great diversity both as regards rank and property. The question, however, is not without its difficulties, and the unfortunate absence of records relating to the period in question, is a bar to the uncertainty being satisfactorily cleared up. It has been computed that at the time of the Domesday Survey there were about 400 persons who held land immediately of the King. In some instances the tenures were very small, and in others exceedingly large, nevertheless it was, probably, not so much with reference to the extent of the lands as in the nature of the tenure, that the difference in the position of the tenant consisted. It was, probably, only those to whom lands had been granted to hold *per Baroniam*, who were designated the "Greater Barons," or "*Barones Majores*," while the remainder were merely Knightly tenants of the Crown. All were summoned to the Great Council of the King—the former by particular writs, whilst the latter, or "*Barones Minores*," were summoned generally through the Sheriffs of their counties.

In the absence of any original record of the Knights' Fees created by the Conqueror, Alexander Swereford, Archdeacon of Shrewsbury, about 1225, one of the Barons of the Exchequer, made from the Great Rolls of the Pipe, a large collection of scutages paid between 2nd of Henry II, and 13th of John. It was intended as the basis for making subsequent levies of the same nature, and is the highest authority which we possess upon the subject. This valuable collection is preserved in a volume known as the "*Liber Rubens*," or "Red Book of the Exchequer." Of the entries in the original hand, there is not one of a later date than 1230, and we find the book quoted at a very early period.

DESCRIPTION AND DIAGRAM OF A SECOND OGAM STONE
AT LEWANNICK.

By ARTHUR G. LANGDON, Esq., Member of the Royal Inst. of Cornwall.

[The information, contained in the following summary, was laid before a Meeting of the Society of Antiquaries, London, January 24th, 1895, and has been published in their Proceedings, 2nd Series, Vol. XV, p. 279.]

On June 7th, 1892, it was my good fortune to find the first Ogam inscribed stone in Lewannick Churchyard, Cornwall, five miles south-west of Launceston.

Mr. F. H. Nicholls, stone-mason, who was, at that time, engaged on some work for me, took great interest in the discovery, and has been ever since on the look out for anything of this kind.

On July 17, 1894, he wrote to inform me that he had found what he believed to be another stone of the same description, built into the north porch of the church. Two days later he wrote to say that he had noticed a second stone, evidently belonging to this latter, in the same porch.

The first piece, found by him—containing the commencement of the inscription,—was built into the north wall and formed a quoin at the north-west angle. The second piece was in the east wall; the lower sides of each being on a level with the ground.

Having sent to Mr. Nicholls the necessary materials, he forwarded to me rubbings of the two portions, on which were undoubted Ogam characters, as well as an inscription on the broad face, but, being built into the walls, the Ogams on the sides were of course concealed, and the vowels were covered by a pointing of cement.

The Vicar's permission to remove the stones was subsequently obtained, and on January 9th, 1895, I met Mr. Nicholls at Lewannick, and was present when he very carefully took

them out of the walls. On placing the two pieces together, they fitted exactly at the fracture. The length (of the two together) is 4 feet 10 inches,—the width 1 foot 1 inch, and the original thickness 10 inches. They have now been cemented together and placed inside the church, in a good light, against one of the columns.

When the pointing and mortar-bedding had been carefully removed, the Ogam proved to be perfectly distinct. At first those on *one* edge were rather puzzling, but at the third attempt I found that they read backward. Those on the dexter angle read in the usual way from left to right, those on the sinister in the opposite direction. In both cases they read from the top downward. The name **ULCAGNI** occurs on both angles,—a repetition which I believe is unique, as far as Ogam inscriptions are concerned.

The inscription on the face of the stone is,—in debased Latin capitals:—

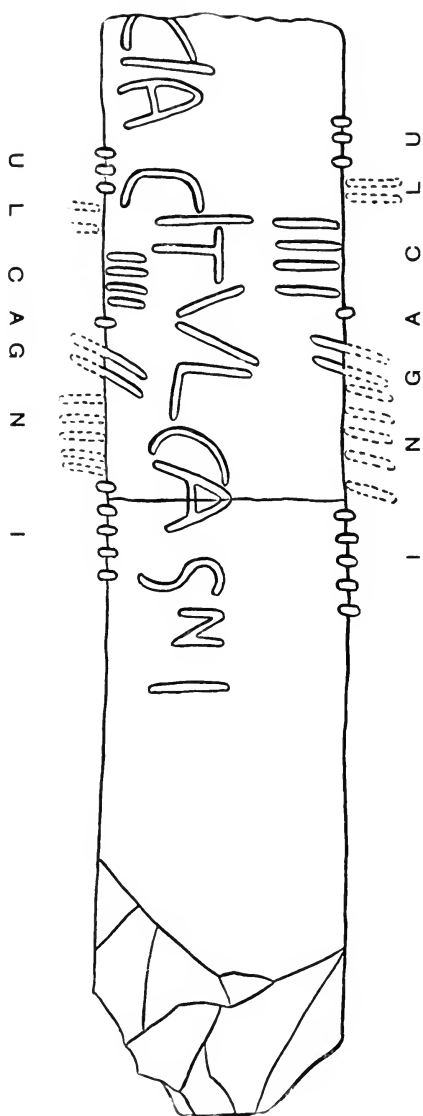
... **C IACIT VLCAGNI**

The first letter, C, is probably part of the word **HIC**, or **IO** as it is often written on debased monuments; the G, in the name, is sickle-shaped, as in many other instances.

It is probable that the uneven line taken by the legend is due to the workman having commenced too low down on the stone,—for, having cut a number of letters, it was found necessary to make a deviation from the straight line, to give room for the longer Ogam.

The name **VLCAONI** occurs also on monuments of this period at Nanscow, in the parish of St. Breock, Cornwall; at Llanfihangel-ar-Arth, in Carmarthenshire; and from Ballyhank, county Cork, now in the Museum of the Royal Irish Academy, Dublin.

With regard to the stone itself, it is what is locally called grey "elvan," equivalent to what geologists call trap dykes. Mr. Nicholls gave me some interesting particulars with respect to its nature. It appears that this kind of stone is found on the surface in small blocks only. The one in question is considered a large specimen. The natural face is quite smooth, so that no tooling is required, and it is on this well-weathered surface that



SECOND OGAM INSCRIBED STONE
FOUND AT LEWANNICK.

the letters are cut. This accounts for the characters being in such a wonderfully good state of preservation, very different indeed from those on the other Ogam inscribed stone, in the churchyard, which is of granite.

Mr. Nicholls is to be congratulated on his discovery, and I venture to think that it will not be out of place, to mention here, that he not only gave his own time and that of one of his men, but also supplied and fixed the two new stones, required to take the places of those removed, at his own expense.

NOTES ON THREE OGHAM-INScribed STONES IN CORNWALL.

By the Rev. W. IAGO, B.A., Co-Editor, Sec. and Past-Pres. R.I.C., Hon. Local Sec.
for Cornwall of the Society of Antiquaries, London.

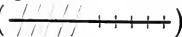
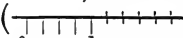
Professor John Rhys, M.A., now the Principal of Jesus College, Oxford, (whose valuable researches with regard to ancient memorials are familiar to antiquaries) rightly claims to have been the first to discover an inscription in Ogham characters in Cornwall.

In the Autumn of 1875 he informed me that he had been searching for Oghams on many of the stone monuments in the county, and had just been successful, he believed, in finding the remains of an Ogham-written legend on one of them, viz. : the well-known "Slovaens, or Slaughter Bridge" inscribed stone, at Worthyvale by Camelford.

Subsequently, in that year, in the October number of the "Archæologia Cambrensis," the result of his visit to that stone was published. In it he wrote as follows :—"Perhaps the most important fact connected with this stone is, that there are the remains of Oghams on its left edge. These end with five notches, for 'i,' which are perfect, and are preceded by longer ones, probably for 'r.'—Are there any other Oghams known in Cornwall?"

In 1876 a further record of the discovery was published by Professor Hübner of Berlin, at page 6 of his work entitled "Inscriptiones Britanniae Christianæ." His words are these :—"In Worthyvale, . . cippus . . dictus . . the slaughter bridge. . . .J. Rhys, qui nuper vidit, . . .*litterarum Celticarum vestigia* superesce primus observavit, in angulis, præsertim in dextro latere superiore,—quæ ei visa sunt efficere hæc :— . . ri."

When the Cambrians and some of our Members lately visited the stone, the five notches forming the letter 'i' were plainly seen.

Professor Rhys, still more recently, has visited me for a second time, and adds that, having just seen the stone again, he is of opinion that the Ogham characters upon it, instead of representing "... RI" () as he at first supposed (in 1875), stand for "... NI" () ; probably part of **LATINI**, which form of word appears, in Roman letters, on the face of the stone.

In 1892, Mr. Arthur G. Langdon, of London, (Author of "Old Cornish Crosses,") and, in 1894, Mr. F. H. Nicholls of Lewannick, made other valuable discoveries of Ogham characters in Cornwall, in both instances the stones being found at Lewannick, near Launceston, and since described in our Journal. (See Vol. XI, pages iv, 285, and the present number of Vol. XII, pages 119-121 ; 169, &c.)

All three of the Ogham stones so far discovered, are of the class rightly or wrongly styled bi-lingual.

The names of the three deceased persons, who are commemorated by these bi-lingual or rather bi-literal stones, are given, in the Roman characters upon them, in the expressions :—

- (1) "*Latini ic iacit, filius* [&c.]"
- (2) "*Ingenui memoria.*"
- (3) "...c iacit *Ulcagni.*"

It is pretty certain that the second of these stands as the *genitive* of "Ingenuus," and we should naturally suppose that the others would be *genitives* of (1) "Latinus, or Latinus," (both of which are regarded as classical), and of (3) "Ulcagnus, or Ulcagnus." On this point, however, the separate views of Professor Rhys and Professor Hübner have to be considered. The former has written thus :—

"*Latini*,—a curious instance of a *nominative* in **I**. *Nominatives* in **I** are common in Roman inscriptions, according to "Corssen (*Aussprache*, &c., p. 289), but whether **I** in such cases "stands for **IS** or not (Corssen mentions *Anavis*, *Cœcilis*, *Clodis*, "*Rogonis*, &c.) it appears that on Roman ground this **I** or **IS** "is only to be expected instead of **IUS** ; but, as *Latinus* is "unknown, one can only infer that the Welsh adopted the Latin "*nominative* in **I** without any regard to the Latin restriction

“as to its use. Compare also Vitaliani Emereto which is a
 “nominative for Vitalianis Emeretos contrary to my former
 “conjectures. I have not heard of the form Vitalianius.
 “This may also be the case with Celtic names, so that
 “Cunocenni, for instance, in the nominative, may not be an
 “instance of a Kymric stem in **I**, but merely an imitation of the
 “Latin declension in question.”

Professor Hübner, in his very comprehensive treatise,
 prefers to regard such names as in the *genitive* case, with “Hoc
 est sepulchrum” understood; and adds (at pages ix, x,) :—

“Raro defuncti nomen nominativo casu legitur.”

* * * * *

“Vetusto Romanorum more, genetivo casu inscribi solebant
 “filii et patris nomina.”

* * * * *

“Contra sermonis Latini legem genetivo casui, quo nomen
 “defuncti positum est, additur ‘filius’ nominativus in hisce :—
 “Latini . . filius Magarii, &c.”

Some observations on the Ogham characters incised upon
 these three stones, will form the subject of a subsequent note,
 with illustrations.

W. I.

A LOCAL STUDY IN PLANT DISTRIBUTION.

By Mr. F. H. DAVEY.

Whichever of the several theories on the distribution of vegetation over the earth may be correct, the tendency of plants to wander and to extend their limits on well defined lines must remain unassailable. Otherwise, in the face of present-day knowledge, it were difficult to account for a similar flora on lands separated from each other by hundreds and sometimes thousands of miles. Thus, although many of the more typical species are absent in the intervening countries, the flora of the Alps is peculiarly arctic, and we very properly conclude that, pushed southwards before the march of the great Ice age, the plants were ultimately stranded on the snow-clad peaks of South Europe, where similar climatic conditions to those enjoyed by their ancestors in the north prevailed, and where, by the self-same restrictions, they have ever since been confined. Similarly the existence of significant groups of plants at places separated from each other by wide tracts of water can be explained with no greater cogency than that of a slow movement from a centre, followed by an equally slow but radical re-arrangement of land and water, whereby two extremes of a country have been separated by a boundless main. All these problems, strictly speaking, are the common property of the geologist and botanist, and conjointly they are ever throwing light on the more intricate points.

But within historic times the wanderings of plants have been greatly complicated by man, and what are known as dissevered species are everywhere found. Since man's inquisitiveness first led him to foreign climes, he has greatly facilitated the distribution of plants, but with this difference: that while, since the dawn of vegetable life, nature has moved slowly and on definite lines, the peregrinations of man have resulted in a distribution sudden, spasmodic, and in many cases antagonistic to the known laws. Let a few examples suffice. It is quite easy to see how a large traffic between two widely separated ports possessing similar climatological and physical features will

eventuate in a fairly general interchange of flora. This sort of thing has been going on ever since primitive man first left his native shore in his frail coracle. At present, due to the introduction of seed with ballast and merchandise, our busiest sea-ports have the richest floras. Within recent years the ballast heaps around Cardiff—by no means the most important town one might mention—have produced plants from almost every land under the sun. Even the flora of inland towns is yearly enriched by the seeds which come from other lands as stowaways, in bales, packages, &c. Finally, not to enlarge on a very interesting subject, it has been remarked that whenever a country has been invaded by a foreign army a distinctively new flora has followed in its trail.*

Coincident with this—if the phrase may be permitted—international exchange of plants, a local re-distribution, is also going on. Within recent years the flora of the Kennall Valley and neighbourhood has thus been enriched by twenty-one wanderers, of which thirteen have become permanent additions. For the sake of distinctness the two classes will be kept separate, and those which have become naturalised will be treated first.

Linaria repens is a notable example. For many years this elegant little toad-flax was confined to the south portion of Mabe, but by yearly increments it pushed its way northward until about twelve years ago it reached the turnpike road from Penryn to Helston. Then in the year 1885 it appeared in profusion on a newly-built hedge near Devas Farm, having taken a sudden leap of over two miles. At about the same time several plants

* “The year after Thorwaldsen’s sculptures had been unpacked in Copenhagen, twenty-five plants of the Roman Campagna sprang up in the courtyard of the Museum, the seeds having, of course, been introduced in the hay, straw, &c., which had accompanied the works of art from Rome. In the campaign of 1814, the Russian troops brought in the stuffing of their saddles seeds from the banks of the Dneiper and the Don to the valley of the Rhone, and even introduced the plants of the Steppes into the environs of Paris. The Turkish army, in its European incursions, left the seeds of Eastern plants to bloom on the ramparts of Buda and Vienna. The Walcheren expedition of 1809 brought *Lepidium Draba* to the Isle of Thanet, where for long it was a most troublesome weed. . . . Since the Franco German war, the seeds of numerous Algerian plants have naturalised themselves on the camping grounds of troops brought from the African colonies, or where forage from the shores of the Mediterranean had been used.”—Dr. Robert Brown, F.L.S., in *Science for All*, Vol. iv., p. 6.

appeared farther north at the entrance to Pascoe Farm, on the hedge separating the trap-rock quarry from the high road. In both cases the cause of the big jump in the wanderings of *Linaria* is clearly traceable. The new hedge at Devas was built of stone brought from Mabe, with which the seed of the wanderers undoubtedly came. At Pascoe Farm, *Linaria* first appeared on the inside of the hedge, and on watching the case I found that near this very spot the carters always dropped their rugs, nosebags, &c., after returning from Mabe and other places whither they had taken stone for road metalling. In this instance the seed must have been introduced by the rugs, &c. At both places the plant has increased with marked rapidity.

Mimulus luteus, the Monkey plant, and *Elodea canadensis* the Canadian pond-weed (which Charles Kingsley newly named the "Canadian curse"), are very recent additions. Both plants are natives of North America; but wherever they gain a footing in Britain they become naturalised, and oftentimes they sweep all native species before them. *Mimulus* has been creeping up the valley alongside the river at the rate of one mile in five years. *Elodea* has a very simple history. Four years ago, as an experiment, I planted a sprig of about three inches in length in a pond in the valley, little expecting it would grow; but it has justly warranted Charles Kingsley's strong expression, in that from this small piece two ponds are now filled.

In the same year a Surrey botanist sent me a puny specimen of *Impatiens Parviflora* a peculiar but somewhat graceful looking Balsam, now tolerably common along the river banks in a few of the eastern counties. This was planted in my garden. The next summer a few plants appeared about 200 yards distant, and during the past season two quarries near the viaduct were crowded.

Scrophularia Scorodonia, the Balm-leaved Fig-wort, one of the rarest of British plants, has crept into the valley within the past decade; but, singularly enough, it keeps to one limited spot near Perran wharf.

Agrimonia Eupatoria, a valuable pot herb, is slowly wandering west from the banks of the Truro river. From Feock to St. Gluvias and Gwennap stray patches may be met.

On the mud near Perranwharf the Sea Star-wort (*Aster Tripolium*), appeared for the first time about six years ago, and at the present time it flourishes more luxuriantly than in its native habitats along the coast. Its presence is doubtless attributable to the seed being brought in the coal barges which are generally moored alongside the place where the plant grows.

To the late Mr. B. Sampson we are indebted for a singularly fine plant or two of *Erica Mediterranea*, the rarest of British heaths. In Mr. Sampson's time this beautiful plant was largely cultivated at Tullimaar, and from this stock the plants in question originated.

For the presence of the Fennel, near Ponsanooth Bridge, the Large St. John's Wort, now flourishing in three places; the Yellow Bed-straw, occupying a hedge at Pelean Cross; and the common Star of Bethlehem, occurring in several places; we have an explanation in the fact that they occupy what, in the long ago, were garden hedges.

Ceterach officinarum, the Scaly Fern, concludes the list of plant wanderers, which, to use an Americanism, have "come to stay" in the valley. This is by no means a West Cornwall fern; and although we have no definite information as to how it got into the Ponsanooth burying-ground, and on a garden wall at St. Stithians, we may be assisted in our inquiry by a recent occurrence at Tremough. A plant of the scaly fern was found growing at this place on a wall near the stables. At first the problem of its presence seemed inexplicable, but when I learned that one of the servants had been cultivating the fern indoors, and that at the seasonal cleanings the carpets were thrown across the wall on which the wanderer grew, I took my cue and concluded that to some adventitious cause we are indebted for the presence of the fern in the Kennall Valley.

Equally interesting has it been to notice the advent, brief struggle, and ultimate disappearance of other plants.

About nine years ago, after some alterations to a hedge by the roadside at the rear of Vale View, the Spotted Medick (*Medicago maculata*), and the Shepherd's Needle (*Scandix Pecten-Veneris*), appeared in large patches. The following summer there was a diminution in the number of both. By the

third year *Scandix* had dropped out of our flora, while *Medicago* was growing "delightfully less." Last year the latter was represented by a single plant.

Ranunculus parviflorus grew in a newly turned corner of the Ponsanooth burying-ground in 1886, but nothing further has been seen of it.

The summer of 1890 gave us the Borage (*Borago officinalis*), on a new hedge at Trevince Moor, in Gwennap, and some beautiful examples of the Viper's Bugloss (*Echium vulgare*), on a rubbish heap at Perranwharf, composed largely of sweepings from a flour mill. How the first-named got to Gwennap, I have failed to ascertain; but I think there can be no doubt that the seed of the latter came to Perranwharf with grain from other districts.

During the following summer the Henbane flowered on some ballast heaps at Devoran, having, in all probability, been brought thither from some other place along the coast.

A corn field at St. Gluvias Burnt House gave us the Buckwheat (*Fagopyrum esculentum*), in large quantities in 1890. Seed were produced in abundance; but no plants have appeared since.

After the Perran Foundry was closed and the machinery disposed of, *Trifolium arvense* sprang up in patches at the lower part of the yard, and for a year or two it seemed to have established itself in the valley. After a time, however, the number slowly lessened, and five or six years ago the last of the plant was seen. From what locality the plant was brought can only be conjectured, but, that the seeds were introduced on the vehicles or attached to the horses which came to remove the Foundry machinery looks feasible.

Trifolium subterraneum is just as notable an instance of plant wanderers as *Trifolium arvense*. As far as I am able to ascertain there is no record of the plant growing in the locality either before or since the year 1888, when a beautiful patch sprang up outside the entrance to Pelean Farm. At first I was greatly puzzled to account for the presence of such a stranger; but I learned eventually that between the owner of the farm and a relative who owned a large farm near Penzance—where

Trifolium subterraneum abounds—there had been a continual interchange of stock, crops, &c., and from this I took my cue. Either as stowaways in fodder, or attached to the coats of live stock, the seed had been brought from Penzance to the place where I had found them growing. In spite of the special contrivance which this plant possesses for burying its seed, it failed to establish itself with us.

Such then, in brief, are a few of the means by which plants are locally distributed. But other and more important issues underlie the above lists than a local interchange *per se*; and questions suggestive of a broad field for inquiry arise on a careful comparison of the wanderers which have become established in the district with those which failed to obtain a permanent footing on the soil. Why should the Henbane, Borage, and Bugloss, all of which grow profusely in other parts of Cornwall, fail to make a home in the district? and why should the Balm-leaf, Fig-wort, the Pale-blue Toad-flax, and the Mediterranean Heath become naturalised? The nutlets of the first three are never scattered far from the plants, and the plants which grew in the district produced nutlets in abundance. Again, why did not *Trifolium subterraneum* and *Trifolium arvense*, both of which are common on our coasts, persist, when the Monkey plant and the Canadian pond-weed, natives of North America, manage to carry everything before them?

There can be no manner of doubt that climatological and physical influences, in conjunction with great and wide-spread movements of the earth, are responsible for the well defined botanical regions which may be traced in both the Old and New Worlds. Plants requiring high temperature to blossom and fruit could not live within the Arctic circle or amid the eternal snows of lofty mountains, and *vice versa*. But great as these considerations are when applied to the flora of widely separated countries, or to plants of such extremes of habit as those which keep to mountain tops and those which love to bloom in sunny dells, they do not seem to suffice for the problem under consideration. The climatological and physical conditions of Falmouth and neighbourhood differ little from those of the Kennall Valley; yet, while tolerably common at the first place, the

Henbane and Viper's Bugloss have failed to acclimatize themselves at the latter. The same may be said of *Trifolium subterraneum* and the Borage, which grow in the neighbourhood of Penzance; of *Trifolium arvense*, which grows in different parts of the county; and of the several others which failed to settle with us.

Contemplating our list of wanderers again, something of importance will be suggested. It will be seen that, with but one exception (*Impatiens parviflora*), the wanderers which have become naturalised are perennials, while those which failed to secure a permanent hold on the soil were all annuals and biennials.

Now, on this particular point what does Nature teach us? If a small plot of ground is trenched over and allowed to remain, the first plants to appear will be very largely annuals. Later biennials and perennials will gain the ascendancy, and the annuals will be reduced to a very low minimum. But it must be distinctly emphasised that where Nature enjoys her pristine wildness this scratching of the surface of the soil with harrow and plough is quite unknown, hence the speedy growth of annuals after these processes is not to be accepted as indicative of the way in which plant distribution was carried on in ancient times. The only natural influences analogous to cultivation are the "weathering" of the face of the country by atmospheric changes, the clearing of the land by extensive fires, and the action of rivers &c., in throwing up banks of mud and sand.

What then shall we say? Does the trend of Nature, the "struggle for existence" in the vegetable world, favour perennials; and have the wanderings of annuals, depending as they do in Nature's wilds on slowly operating or accidental causes to prepare the soil, been less direct, less regular? It is a notorious fact that wherever Nature has her own way the endemic flora is largely perennial; and on the writer carefully reviewing the census of stations of the British flora as given in the "London Catalogue," he was met by the interesting fact, that perennials have generally the widest distribution, and that whenever annuals have high records they are almost always

plants which frequent cultivated lands, or which follow the movements of man, such as the annual poa grass, the shepherd's purse, the common fumitory, and the chickweed.*

It would seem, then, from what has been stated, that the wanderings of perennials have been, and still are, more widespread than those of annuals, and that, given a centre in which both occur, the former will eventually stamp out many of the latter, and spread further afield. Dean Herbert put the question in a nutshell when he said "plants do not grow where they like best, but where other plants will let them."

To dogmatize or even theorize from these data were a decidedly unscientific method of treating a very scientific subject; but, obviously enough, we have here a subject the study of which may clear many difficulties now surrounding the present distribution of plants.

* That man is responsible for the wanderings of many annuals into remote countries, is clearly proved by the experience of Sir J. D. Hooker, in the Himalayas—"Along the narrow path I found the two commonest of all British weeds, a grass (*Poa annua*), and the Shepherd's purse! They had evidently been imported by man and yaks, and as they do not occur in India, I could not but regard these little wanderers with the deepest interest. Such incidents as these give rise to trains of reflections in the mind of the naturalist traveller. . . . At this moment these common weeds more vividly recall to me that wild scene than does all my Journal, and remind me how I went on my way, taxing my memory for all it ever knew of the geographical distribution of the Shepherd's purse, and musing on the probability of the plant having found its way thither over all Central Asia, and the ages that may have been occupied in its march."—*Himalayan Journals*, Chap. ix.

ON A SODA-FELSPAR ROCK AT DINAS HEAD, NEAR
PADSTOW,

By HOWARD FOX, F.G.S., President of the Royal Geological Society of Cornwall,
and one of the Council of the R.I.C.

An interesting rock occurs at Dinas Head, four and a half miles west of Padstow. This rock is interbedded with slates and also in immediate contact with greenstone. It weathers white and has the appearance of chert, varying in colour from creamy grey to various shades of brown and dark bluish grey. In many places it is studded with cavities, not unlike pholas holes, which have been filled with rusty coloured material containing crystallised quartz. This rusty material occasionally weathers out as nodules three-eighths of an inch in diameter, projecting, from a quarter to half an inch, beyond the white surface of the rock. Most of the rock shows distinct bedding and even lamination; but in a limited area near the N.E. corner of the peninsula, its entire substance assumes a nodular grey character weathering grey, and some of the nodules have a radiated or spherulitic structure.

Mr. Beringer having kindly undertaken the analysis of three specimens of this rock, representing its three chief varieties, entrusted the work to his pupil, Mr. A. F. Hosking, who determined the rock to be similar in composition to a soda felspar or albite, containing nearly ten per cent. of soda, and a slight per centage of potash. The rock, however, does not show the optical characters of albite under the microscope. The compact varieties are crypto-crystalline, and might easily be mistaken for chert; but the concretionary and spherulitic varieties show grains and blades of a felspar which is doubtless albite.

Some unweathered pieces were subsequently analysed by Mr. J. Hort Player, of London, who confirmed the results arrived at by Mr. Hosking. The silica in the various analyses varied from 64.4 to 66.6; the alumina from 19.6 to 20.2 per

cent. The hardness was 6 to 7. The specific gravity 2·63. How could such a rock have been formed?

Mr. Teall, in his *British Petrology*, describes a sedimentary rock altered by contact with an igneous rock to which the name of *Adinole* has been given. Adinole has been found by German geologists to contain as much as 7·5 per cent. of soda when in immediate contact with an igneous rock; the eruptive rock having impregnated the surrounding sediment with a portion of its own material. The spherulitic and concretionary structures at Dinas head under this hypothesis are difficult to account for, as they are generally supposed to indicate a fused rock. Could this rock be a soda felsite or keratophyre? It is not easy at present to explain its origin, but it is certainly of interest on account of its remarkable composition.

Maps and a diagram enlarged from a sketch by Sir A. Geikie, Director-General of the Survey, now on your walls shew that the greenstone is intrusive in, and posterior to, this "adinole." Both rocks have undergone such a degree of crushing in many places as to alter their lines of junction. Microscopic sections of the rock have also been shown. In presenting specimens of this "adinole" to the Institution, it is hoped that the members will be led to examine carefully the various coast exposures of greenstone and slate in order to discover whether any rock similar to that at Dinas Head can be found elsewhere in Cornwall. New discoveries may throw more light on the relations of the rock, and help to solve the difficulty.

Mr. A. F. Hosking's analyses :

	No. I.	No. II.	No. III.
Loss on ignition ...	1·7	1·3	1·6
Silica	64·4	64·8	64·6
Titanic Oxide ...	1·	1·5	1·2
Alumina	20·2	19·9	20·4
Ferric Oxide ...	·7	·7	·7
Lime	1·6	·7	1·3
Magnesia	·2	·1	·1
Alkali	10·4	10·2	10·1

The Alkali is mainly soda;—by titration with acid it represented 9·6 per cent. of soda on the assumption that soda was the only alkali present. The potash in one of these

specimens was 0·47 per cent. In Nos. 1 and 3, the bulk of the iron and lime is in a form easily soluble in acids; this is pretty true of No. 2, but the soluble fraction is very small.

J. J. BERINGER.

No. I of foregoing analyses was the creamy grey variety, with cavities filled with rusty material weathering out in nodules beyond the white surface of the rock, contiguous to the greenstone.

No. II was a compact dark grey variety, weathering white, from the summit of the Head, in close proximity to the mass of slate.

No. III was the grey nodular spherulitic variety, weathering grey, from the North-East corner of the Head.

Mr. J. Hort Player analysed a compact unweathered specimen of the creamy grey variety of this rock, free from nodules or cavities, and found the composition as follows:—

				No. IV.
Silica	...	...	...	66·6
Titanic Acid	...	...	...	·8
Alumina	...	...	...	19·6
Ferric Oxide	...	...	...	·9
Ferrous Oxide	..	...	...	·2
Magnesia	...	...	...	·3
Lime	...	...	...	·4
Soda	...	...	...	9·8
Potash	...	...	...	·7
Loss by ignition	...	...	...	·8
				<hr/>
				100·1

Mr. J. J. H. Teall, F.R.S., kindly examined microscopic sections of the spherulitic rock for me, and reported as follows:—

No. 353. A remarkable spherulitic rock, spherules sometimes measuring $\frac{1}{4}$ -inch in diameter.

The central portions of the spherules are generally composed of crypto-crystalline material. The outer portions of radiating blades or prisms of feldspar, presumably albite. Ferric oxide, probably resulting from the decomposition of a ferriferous carbonate, is scattered through the slide in irregular patches, and concentrated in veins. Some of the patches, by their form, suggest

that the ferric oxide is a pseudomorph after a carbonate. The interference of adjacent spherulites produce polygonal sutures in which the ferric oxide is sometimes concentrated; but it occurs also in the spherulites.

No. 354. Similar to the last.

Ferric oxide in radial streaks between the blades or prisms of feldspar, which form the radial portions of the spherulites.

No. 355. Similar to the above, but with the ferric oxide almost wholly concentrated in the polygonal sutures formed by the mutual interference of adjacent spherulites.

No. 356. Adinole? interbanded with slates. Dinas Head. Compact banded bluish grey rock with brown rusty spots. Under the microscope the structure of the main mass of the rock is seen to be crypto-crystalline, but the nature of the material cannot be determined. The brown rusty spots are sometimes irregular, and sometimes of such forms as would be yielded by rhombs. There can be no doubt that they are pseudomorphs after a ferriferous carbonate.

J. J. H. TEALL.

POSTSCRIPT.—Since the above was written, Mr. Beringer informs me that in Brooke & Miller's Mineralogy, an analysis of Adinole from Lerbach in the Hartz by Schnedermann shows 10 per cent of soda.

THE RUDE STONE MONUMENTS OF CORNWALL.

By R. N. WORTH, F.G.S., Corresponding Member R.I.C.

PART II.

MENHIRS.

It may seem at first sight somewhat strange that circles should have been considered before menhirs—monuments of many stones before those of one. But a circle is not in any antiquarian sense an aggregate of menhirs; and we shall see as we proceed that the circle is really the most simple form of rude stone monument, and the one which has the most restricted meaning.

A menhir on the other hand may have many purposes. The difficulty is less in ascertaining what these objects may be, than in deciding which to choose as the special intention in a particular instance. These purposes may be classed as follows:—

A. Memorial. This is the simplest use of a stone pillar. Hence stones are erected in all ages and in all countries as the silent witnesses of special events, localities, or people. We read the record of the erection of memorial menhirs in the earliest pages of history: we erect them for similar objects now. The column which commemorates the great fire of London,—as that which preserves the memory of the brothers Lander,—but illustrates the sentiment that led to the rearing of Pompey's Pillar or Cleopatra's Needle, or the setting up of the stele at Mizpah.

And so the modern boundary stone is simply the surviving exponent of a custom which dates from the veriest dawn of civilization; and the everyday headstone merely the successor of the sepulchral pillars of forgotten races. It mattered not what had to be commemorated—thing, or place or person, the upright stone was at once the plainest, simplest, and handiest means of attaining the end in view, and its adoption to that end is one of the universal instincts of common humanity.

B. *Religious.* Here also proof is clear that upright stones have been employed as direct emblems of the deity, worshipped as symbols of the energies of nature, treated with divine honours—from the earliest records of the human race until now. Capt. Conder remarks: “there is no doubt whatever that the menhir is the emblem of the man who erects it, and that such stones were, of old, considered to be themselves the habitations of divinities.”* And while the cult of the menhir yet abides in the East where such stones are still set up (as by the dwellers on the Khassia hills in fulfilment of pious vows), and they are still the object and centre of acts of worship,—it is equally certain that in Europe many menhirs were long regarded as something sacred in themselves and worshipped in various ways. Christianity has even yet failed quite to destroy superstitions connected with such monuments, which unquestionably had their origins in ancient and familiar rites.

Thus, in Skye there were in every district what were called *Grugach* stones, presumed to be dedicated to the sun, on which were poured libations of milk. In the West Indies, standing stones had a double symbolism—being associated with phallic worship and the cult of the sun. In the East Indies stones are erected in fields, to represent the deities who are supposed to safeguard them; and a form of worship is the anointing, or in less polished phrase “smearing” them, which continues to be practised in parts of Europe—as in Sweden, for example, on stones with small cupped holes sunk in them. It is a curious coincidence, if nothing more, that in Cornwall we should have the “Three brothers of *Grugith*,” as in Skye those *Grugach* monoliths, and that these “Three Brothers” should bear those mysterious cup markings, not certainly known to exist elsewhere in the West. It may even be that there is a link between the stones frequently seen in fields, set up in modern days as rubbing posts, and the guardian pillar-deities of the East, and the form of that suggestion seems to be heightened by the fact that such rubbing posts are more common in districts where old customs and superstitions have most sway. The connection can only be a shadowy speculation at the best, yet, even so, it is well to put

* Heth and Moab, 208.

it upon record. And some of the field posts, extant in the West, are undoubtedly of very high antiquity.

The sacred stone pillar of the East is closely linked to the simple form of Pagan altar of the West, which was indeed nothing more than a rudely shapen monolith. When Jacob erected his menhir at Bethel and poured oil upon it, his act was absolutely identical with the practice of anointing such stones with oil yet current in India, and referred to by various authorities as having been a common pre-Christian custom throughout the civilized world, which Christianity by no means found it easy to destroy, and in fact has not destroyed. We need not hold that such stone idols were absolutely believed to be themselves deities. It was enough that they were regarded as emblems of the gods, or that in some special sense the gods were thought to dwell in them; nor are there wanting reasons for concluding that this belief in their sanctity developed from an original idea that they in some sort typified the life energy of nature, as in certain localities similar stones are regarded as doing now. But such inquiry cannot be followed out here. There is later evidence that Menhirs were at times the scene of human sacrifices, and that they were anointed, not merely with oil, or with the blood of animals, but with the blood of the human victims. And this really appears to be all we know concerning the religious ideas connected with them. There is no trace anywhere that they had any special association with solar worship, though in Greece and in Rome the Sun-god was one, among others, to whom certain sacred stones were regarded as dedicated, and, as we have seen, the same idea is found to prevail in the Ultima Thule and Skye.

The general problem to be solved with regard to the Menhirs of Cornwall, is, to which of these classes they belong; and whether, if to both, we are able to identify a special purpose in individual cases. The fact that they are simply called "menhirs" in Keltic phrase, or "longstones" in Saxon—a purely descriptive and not ascriptive epithet—suggests indeed that no special purpose was present to the minds of those who named them.

Now, in the first place, we can at once eliminate from this enquiry the somewhat numerous inscribed stones—the Mén

Scryfa and its companions. These of course date from a time subsequent to the advent of the Romans, and in most cases probably—not in all certainly—after the introduction of Christianity. They are purely individual. They express man's natural craving for a more distinct commemoration than the mere unlettered pillars, the personal memories attached to which most quickly pass away. But they cannot be regarded as having any religious bearing, save in such instances as the Doniert stone with its "Doniert rogavit pro anima," and the sybstel removed from Castle Goff to Lanteglos, erected, as the legend thereon states, for the "good of souls."

So many of these stones are so closely connected with churches, that we may fairly assume them to date practically from the early appropriation of special sites to Christian purposes—as for example, those at Cubert, Lewannick, Phillack, St. Hilary, and Tregoney. The Mén Scryfa itself has a cross at the beginning of the inscription, and there is no reason to question that this cross is the Christian emblem. As we all know, there are early cross-forms besides, which have no connection with the Christian faith.

I am by no means clear that we should not regard many of the earlier and ruder crosses, so common in the county, as due to the desire of the early Christian inhabitants to attach a Christian significance to a form of memorial which has, at the very least, been regarded by them as secular; but which I think is far more likely to have retained a heathen atmosphere. Indeed, as in the guise of superstitious customs the worship of stones cannot be said to be quite dead in Cornwall, even now, it seems highly probable that the famous letter of Pope Gregory, calling for the consecration to Christianity of the temples and sacred sites of the earlier faith, found plenty of scope for its operation in this county. And hence it appears somewhat more than probable that in certain of these rude crosses we have simply prehistoric menhirs, roughly converted to Christian uses. But frequently, especially in Brittany with its kindred race, crosses have been planted on them. Mawgan cross for example is in all likelihood a menhir adapted as a memorial, and furnished with the cross-head which has now long disappeared. And the

idea that certain unconsecrated menhirs became objects of avoidance to early Christians, also seems suggested in the name of the "Devil's Whetstone," applied to one in North Cornwall, while elsewhere we have the "Devil's Arrows," and kindred designations.

Memorial stones thus set aside on the one hand, and presumably converted crosses on the other, we find ourselves confronted by a point of considerable difficulty. There are many boundary stones and cattle posts in the county, of comparatively modern date. How shall we know if any particular menhir is prehistoric? Only, I think, in one of two ways. We must either judge it by the company it keeps, or by some special feature of locality. When we find a menhir associated with other rude stone monuments we may safely rank it with them. All other cases must stand on their own individual merits.

Now while it must be granted that the inscribed menhirs are not only memorial but sepulchral—fairly equivalent in fact to the modern headstone, it must follow that some at least of the plain examples are sepulchral likewise. We cannot believe that a class of monument commonly used for one special purpose should be suddenly—indeed violently—adopted for quite another. The conclusion would be absurd. Besides we know that the menhirs associated with the stone rows of Dartmoor are sepulchral, and that human remains have now and again been found at their feet in Cornwall (Mr. Burlase thus records Pridden, Trelew, Trenuggo, Tresvenack, Tregiffian—associated with a kist-vaen), while at Trewren and Treganneris graves were found to be between them; and in some other cases where remains have not been seen it may very well be because they lie directly beneath. My own view therefore is clear, that most of the Cornish prehistoric menhirs are not merely memorial but sepulchral; and in this category I should include generally those associated with circles. Commonly indeed the association is merely one of antiquity, just as in a modern graveyard a vault and a headstone and a private burial plot may adjoin, with no necessary connection beyond their common purpose.

Other menhirs may very well commemorate important events or special sites, and there is absolutely no evidence on which we can decide,—so-called tradition being practically worthless.

But with regard to the possibility of religious uses we may assuredly go a step further. A sacred character would, as a matter of course, attach more or less to the memorials of the dead, and it so happens that while Cornwall, as far as I am aware, is silent in the absence of any distinctive feature on its menhirs, Devon has something to say. As in the case of the circles we pray either county in aid of the other.

There was found in 1879, at Lew Trenchard, by the Rev. S. Baring-Gould, a menhir which had long lain buried, by the side of an old mill leat, on the worked top of which a little hollow had been sunk. Such hollows had been observed on the tops of menhirs in Brittany, but until this discovery at Lew Trenchard, it had been thought they were simply holes made to receive the shafts of the small crosses so frequently planted, to Christianise them, as already noted on these stones in that country. No such use, however, could be ascribed to this hole in the Lew Trenchard stone, and the reasonable supposition now is that these holes were in existence before the Christian era, in which case they must have had some connection with the practice of anointing and lustration. Hence some at least of the western menhirs belonged to our second class, and were connected with religious observances. These may very well have included such fine examples as the one in Constantine, which stood 20 feet above ground and was set four feet below ; possibly also The "Pipers,"—the finest Cornish pair,—15 feet and 13 feet 6 inches respectively. It may also apply to the "Old Man" on St. Breock Down. Mr. Borlase thought this stone had been enclosed by a circle. Still so far as Dartmoor is concerned, the menhir is only connected with a circle when the general inferences are sepulchral, and a sepulchral stone might as well be honoured out of respect to the one whom it commemorated, as worshipped as the representative of deity. There was never any very sharp or certain line between the manes of the dead and the spirits of the gods, and the reverence due to either would be rather in degree than in kind. There is absolutely no evidence of the

presence of phallic rites in the West in the times under review, yet the wide-spread character of that cult rather suggests such presence, and if so, the further association therewith of some of our menhirs would be inevitable.

With regard, then, to the menhir question generally, these considerations are, I think, as far as we can safely, or at any rate wisely, go.

CROMLECHS AND KISTVAENS.

I cannot do better than introduce what I have to say touching cromlechs—a word which I use as it has been commonly used in England, as equivalent to the dolmen or table-stone of the continental archæologists—by quoting the graphic summary of Capt. Conder, which prefaces his account of the remarkable dolmen fields of Moab.*

“It is evident that an erection of two or more stones, with a flat stone roof or table above, may have had several uses. It might be an altar, or tomb, or a dwelling house . . . We have to consider not only trilithons and stone boxes of four, five, and six stones, but also galleries, like those called “*Grottes des Feès*” on the banks of the Loire, built of perhaps a dozen stones in all, together with the great chambered tumuli of the bronze and late-stone age, the Kune beds of Scandinavia, the giant beds of Ireland or of Ammon, the demi dolmens of France and Moab; while the cists in the tumuli of the iron age, and the Arab trilithon altars of our own time, are but degenerate representatives of the older dolmens. It is clear that no hasty generalization is possible in such a case, and that dolmens are structures of primitive architecture, which may include more than one class, and may have been built for more than one purpose.”

The point for us to consider is the class or classes to which the Cornish cromlechs belong. What such may be elsewhere is not absolutely essential to our enquiry.

One of the first points for decision is whether there is any real distinction between a free standing cromlech, and one that is or has been covered by a mound or cairn: which really

* *Heth and Moab*, 222. But Capt. Conder figures as an Arab trilithon, what is really the doorway of a hut circle—the lintel surmounting the door posts.

resolves itself into the initial question whether there is of original purpose such a thing as a free-standing cromlech in Cornwall at all—whether, in short, our cromlechs were not either covered by mounds originally or perchance so intended to be. Herein is matter of great controversy, and indeed it lies at the root of the whole question ;—for a buried cromlech cannot be regarded as anything but sepulchral, a bigger form of the simple kistvaen, more or less capacious.

Capt. Conder unhesitatingly holds that most of the Moabite groups—probably all—could never have been covered by a mound at all. But then they differ very materially from the Cornish cromlechs, if we are to interpret literally his statement that “the main object of their erection seemed always to be the construction of a flat table, arranged with a slight tilt in the direction of its length.” Cup hollows, sometimes connected by channels, are frequent on and about the dolmens, and the conclusion in his view was irresistible that there are evidences of some sort of libation on the dolmen, which “in the modern instances is simply a table or altar for offerings.”

But while a buried cromlech is beyond doubt sepulchral, it by no means follows that a free-standing one is not. Certain tribes in India continue to bury in free-standing cromlechs to the present day, and surround them by circles of standing stones, and in short, as Dr. Hooker says, habitually erect dolmens, menhirs, cists and cromlechs, almost as gigantic in their appearance and construction as the so-called druidical remains of western Europe—the objects of their erection being sepulture, marking spots where public events have occurred, and the like. Thus the “unchanging East,” supplied the key to the riddle of the changeful West.

Mr. W. C. Borlase, in *Nenia Cornubiæ*, adopted a distinction between cromlechs that might be regarded, from the character of the supporters, as columnar structures, and those in which the enclosed character of the kist is preserved, while he treated a third type as merely cenotaphs, erected over a grave to indicate its position, and therefore a close analogue of the modern altar tomb. As to which I would remark, that the original idea may be as well preserved by the more slender as by the more massive

supporters—just as the columnar circle carries with it the suggestion of enclosure and separation as completely as the continuous; and that the one therefore might as well be used for a cenotaph as the other.

Using the term in its wider and differentiated sense, we shall find that the majority, if not the whole, of our Cornish cromlechs can cause no difficulty.

The Lanyon cromlech had without doubt a grave within the cell, and the line of its investing barrier may yet be traced, though not so clearly as when Dr. Borlase wrote; while that at Lower Lanyon, which was buried in a mound when found, also gave evidence of interment. So with the cromlechs at Chywoon and Mulfra and Bosporthenis. Each was covered by a cairn, and each was used for burial. Zennor cromlech again was enclosed in a cairn, and this is most emphatically the case with the so-called "druid's altar" at Pawton, which is nothing more nor less than a huge kist. So the "Three Brothers of Grugith" simply cover a grave.

The re-erected Caerwynen cromlech has yielded no trace of interment, probably because it has not been adequately explored. Nor is any recorded in connection with the structure at Trethevy, which, however, is an unmistakeable kist; while there is no testimony either way for the destroyed example at Quoit, near St. Columb. Mr. Borlase classes the Caerwynen with the Lanyon as the only instances in the county of cromlechs proper, that is the columnar supported dolmen. But neither was rebuilt on the original plan, and in both, the stones are present, unutilised, which complete the original kist. So far as Cornwall is concerned, therefore, the columnar cromlech has no existence.

Hence the only problem left open in connection with the purpose of the Cornish cromlechs, is the question already stated—whether they were all in the first instance covered with a mound or cairn, or whether they were free-standing. And this resolves itself into the one instance of Caerwynen and cannot affect the assignment. The fact that while the Trethevy cromlech stands on a mound its stones are bedded in the natural soil, indicates at once the former existence of a superincumbent cairn, no doubt in part removed to build the houses hard by.

The negative evidence of Caerwynen is that the structure was free-standing, and its features may afford some slight ground for regarding it as a memorial reproduction of the more ordinary type. But then instead of looking upon it, with Mr. Borlase, as of the most primitive character, I should be inclined for once to agree with Dr. Fergusson, that it is of the most modern.

Cromlechs are much less frequent in Devon than in Cornwall. The only one yet standing, and that, like Lanyon and Caerwynen, rebuilt, though on more careful lines, is the Drewsteignton "Spinsters' Rock," which may be looked upon, curiously enough, as supplying a link between the columnar and the kist types, and which possesses no trace of an investing mound. Another, now ruined, at Coryndon Ball, was, however, buried in a cairn of great size, demolished to build an adjacent wall. The Drewsteignton cromlech was associated with circles and stone rows, which have disappeared, a noteworthy point, since none of the Cornish examples seem to have been; though circles round the smaller kist-vaens are by no means uncommon in the county. The importance of this fact is that it brings the cromlechs in line with the rows and circles generally, which, we have already seen, are of Neolithic date.

Mr. Borlase had not such advantages as we have from the recent explorations on Dartmoor; but he seems to have had a glimpse of what might be in store—though missing the exact point—when he wrote, of the Chywoon cromlech, which stands at a distance of only 250 paces from the hill castle, close to a British village, the castle itself containing foundations of huts,—"What does this imply? Either that the cromlech is a more recent structure than the castle, or else that the builders of the castle allowed the cromlech to remain unharmed while engaged in their work, and put themselves to the labour of obtaining stone from a greater distance rather than disturb the structure."* But surely the correct reply here is "neither earlier nor later, but (as in the case of the circles and stone rows and the kist-vaens of Dartmoor associated with them) contemporaneous." That alternative was always open; but we need not wonder it was not recognised.

* *Nænia*, p. 269.

It is impossible to dissociate the kist-vaens and the cromlechs from the chambered barrows, as at Brann in Sancreed and Pennance in Zennor. All belong to one class of monuments. All are different expressions of the same purpose. As to whether the kist-vaen is to be regarded as having grown into the cromlech—the coffin into the vault, the death-bed into the death-house; or whether the process was not otherwise, and the house of the dead dwindled of intention or inability into the chest—it is hard to say. What seems certain is that a time came when all these forms were in vogue, and when the choice between them was rather one of dignity, or strength, or skill,—just as in funeral ceremonies now—than for any other reason. Hence such combined interments as are found in the tumuli at Chapel Carn Brea and Ballowal. It does not seem probable that the cromlech formed the link between the kist and the chambered cairn; the latter was an independent development of whatever was the original type.

Here again the name does not help us. The word cromlech seems to mean really a crooked or a curved stone, as most of the cap stones were. The kist-vaen is simply a "little chest." So the alternative dolmen is the "table stone." As with the menhir and the mên-an-tol the nomenclature is purely descriptive; and the ascriptive element is wholly wanting. There is no trace whatever that the authors of these names had any knowledge of the original purpose of the monuments, or that they put them to current use. It is just the same as with Dawns Mên, or the Merry Maidens, or the Hurlers, or the circles. In Stonehenge we have, in like manner, simply the "hanging stones;" and so Hingston Down, like the Hingston which formerly existed at Cattedown, near Plymouth—in name Stonehenge reversed—is far more likely to refer to a long vanished cromlech than to any imaginary connection with Hengist and Horsa, or to conflicts between Saxons and Danes. In considering all those monuments we must also bear in mind that they are merely a remnant host, though in some localities the losses need not have been many or great, Cornwall being one of the most prominent instances.

MÊN-AN-TOL.

The holed stone monuments, of which the Mên-an-Tol is the leading example, are the chief crux of the western archæologist. They do clearly embody a religious sentiment of some kind, but precisely what that sentiment might be, it is more difficult to conjecture. The holed stone at Stennis, in the Orkneys, was made the means of adding solemnity to oaths, men holding each other's hand through the aperture, and so swearing faith. The holed stone at Applecross was held to cure disease. There are people yet who believe that the Madron Mên-an-Tol, or the Gweek Tolven, will heal crick or rickets; and who pass their children through cloven ash trees, both in Cornwall and in Devon, for the relief of rupture. Dr. Borlase noted, from Martin, that libations of beer were poured into holed stones in the Shetlands to propitiate a spirit called Brownny; but query whether these were holed stones in the present sense. And very recently, I learn, children have been passed through a natural perforation in the menhir at Minchinhampton for the cure of whooping cough and measles.

Superstitious practices, connected with passing through narrow openings, by way of ordeal, are and have been common enough in all parts of the old world. They are even grafted upon Christianity, as for example the slit-way in the Saxon crypt at Ripon, called St. Wilfred's Needle, threading which was regarded as a test and proof of chastity. It seems idle, however, to conclude that the "needle" was formed with this object, and not subsequently made the instrument of an older superstition. And I think we shall see, by and by, that this may very well have been the case with our Mên-an-Tol. There is a trace of the same idea in the fact that penitents who squeeze themselves through a sacred perforated stone at Malabar obtain remission of their sins. But the original significance of such holed stones seems rather to have been connected with re-birth, after death; and this might easily become the parent of the idea of re-birth from sins.

I may say at once that I exclude from the category of tolmen such stone "deities" as Dr. Borlase cites at St. Mary's, Scilly, and the island of Northwethel in the same group, with the

so-called Tolmen of Constantine, the destruction of which, a few years since was so much lamented. All these, with the Logan stones, and the rock-basins, and such quaint piles as the Cheesewring and Bowerman's Nose, and the mural crests of the Dartmoor Tors—I ascribe purely and solely to natural causes on the one hand, and ignorance of those causes and their effects on the other. Granite rock groupings and weatherings of this kind literally teem in the west, and it is always the size—never the conditions—that attracts attention.

And I am afraid that “holed stones” have been brought into the series, claiming only a very matter-of-fact purpose and origin. Dr. Borlase suggested that certain holed posts near Rosmoddress circle were used for tying victims to, preparatory to sacrifice. It is a great deal more certain that some such were simply pierced to receive the bars of a fence, that others may have been used for haltering, and others again in connection with gates or mining operations. The holed gate-posts, for example, at Buryan and Bosworton, figured by Mr. Lukis, are absolutely identical with gate-posts through which I have seen the shanks of hinges or catches passed and secured by nuts. The line of holed stones at Tregaseal—8-ft. 9-in., 21-ft. 6-in., and 6-ft. apart—need suggest nothing more than the passage of fence rods; holes of $5\frac{1}{4}$ to $3\frac{1}{4}$ -inches in diameter are no way remarkable. I have seen several fences so formed. While such casual occurrences as the stones figured by Mr. Lukis, from Trelew, Wendron, and Tregiffian might well have been used for haltering.

As for the holed slabs. Big flat stones are not infrequently used for the stiles of foot-paths and fields; and it is by no means unusual to find holes broken through them to afford a stepping place in climbing over. Removed from its connection, such a stone, to the uninitiated, might well become a mystery, no less remarkable say than the Tolven.

So far therefore as I can see, the only holed stones that call for consideration, as antiquities of the rude stone age in Cornwall, are the Mén-an-Tol and the Tolven. The latter is simply a stone slab with a circular aperture, $16\frac{1}{2}$ -ins. in diameter, wrought equally from either side, which has been moved from

its original position, and the only record that attaches to it is that it has within living memory been employed like Mên-an-Tol to pass children through to cure them of rickets.

The Mên-an-Tol, however, does not stand alone, but is so related to other stones as to form part of a monumental group, being placed exactly midway between two small menhirs—9-ft. 9½-ins. apart, next to one of which there is a fallen stone while another standing stone is 32-feet from the western stone of the Men-an-Tol set, and a fallen stone 26-ft. These outliers being just 10 feet apart.

The hole of the Mên-an-Tol is ovoid rather than circular—21-ins. in one diameter and 18 in another. It has been formed by countersinking as in the case of the Tolven, the working being unequal, and, as Mr. Lukis suggests, purposely so. And as the deeper of the two sinkings is on the eastern face of the slab, he also suggests that its use was from this side, and that sun worship can have had nothing to do with the ceremony, for the actor would have had to turn his back upon the luminary.

The presence of holes in dolmens and cromlechs is of frequent occurrence. They are found in the end stones of both modern and ancient cromlechs in India; they are also found in Circassia and in France and other countries. There is a hole in the capstone of the Trevethy cromlech, but this is rectangular, and no doubt of later date. Now I cannot myself see how we can dissociate holed stones of this class from such holed stones as the Mên-an-Tol, especially as a holed stone precisely of the same character as the latter has been found dividing two compartments in a long chambered barrow. If the superincumbent earth of that barrow were removed and the side stones displaced, the remnant would be indistinguishable in plan and character from the Mên-an-Tol itself. There are indeed numerous instances of perforated stone entrances to chambered tumuli—some apparently natural and others formed for the purpose. At Rodmarton, in Gloucester, the hole is wrought out of two stones set side by side. And it has been suggested that the idea sought to be symbolised is that of re-birth already noted. Some think that robbers made the holes.

It has occurred to me that we may possibly connect such holes in monuments, so evidently sepulchral, with the evidence afforded by numerous barrows of the practice of the barrow-builders of the art of trepanning, carried out, (albeit only with flint tools), with exceeding skill. Their object seems to have been,—reasoning from somewhat analagous customs among modern tribes, to afford an outlet from the body, of a spirit supposed to have caused disease, and particularly epilepsy. The belief that spirits require to have egress provided them is widely prevalent at the present day. Even in England and in Scotland now there are localities where it is the custom, when anyone is dying, to open the doors of the house to let the spirit pass more easily. And it is not by any means an infrequent belief, whether among the followers of certain religions in the ancient East, or among more or less savage tribes in the modern West (indeed we find the dogma all the world over), that the spirit remains by the body until decay destroys its accustomed habitation. It was therefore the most natural thing in the world for adherents of cults embracing this article of faith, to provide an opening for the departure of the spirit when the progress of decomposition had released it. And this really seems to be the explanation of the openings in modern Indian cromlechs. At first distinctly utilitarian and actual, such things always tend to become more and more indicative and ritual. And all this fits in with the custom noted from several western kist-vaens—and very familiar elsewhere—of placing, with the dead, food and others matters presumed to be required by the spirit on the final passage to the hereafter.

A further fact in connection with the Mén-an-Tol itself is specially important, and brings it well into line with other rude stone groups in the county. It runs N.E. and S.W., which we shall find correspond, with slight variation, with the general orientation of undoubted sepulchral monuments of presumably the same age. Thus the kist at Grugith, The Trethevy cromlech, Chambers at Tregiffian, and Ballowal, all point N.E. and S.W. Kists near the Stripple Stones and the Nine Maidens, only vary to N.N.E. and S.S.W. The Mulfra and Chûn cromlechs, with interments at Ballowal, Tregaseal, and Pennance, point N.W. and S.E., closely followed by the N.N.W.

and S.S.E. of the kists at Chapel Carn Brea. The rule is not absolute, for the Zennor cromlech is placed E. and W., and the Pawton, N and S. But it is evident that the orientation of the Mên-an-Tol has a general relationship with the orientation of these other memorials, which we cannot disregard.

If then we are prepared to accept the view that the Mên-an-Tol is not a complete monument, but a ruin, we shall, I think, have no difficulty in bringing it into general accord with our older sepulchral monuments, and in placing it in the same particular category as the chambered barrow with the holed stones already cited. In this case the Mên-an-Tol proper, with the stones directly E. and W., would represent, lengthwise, the chamber of a vanished barrow. The other stones, close by, might well have formed part of that chamber, or indeed of an enclosing circle. It is quite clear, also, that if the Mên-an-Tol group is to be regarded as original and complete, the Tolven stone is defective; while, if the hole alone is to be considered, there is no reason why one should be treated as typical rather than the other. The modern practices connected with either and with holed stones elsewhere—and carried out in variant form with riven ash trees—need have no direct connection with the original intention or use, and in all likelihood have not. There is, after all, very little difference in the spirit which prompts a modern antiquary to invest a rude stone monument with a plausible hypothesis, and that which led his equally ignorant, less cultured, but more practical predecessors, to conceive that these memorials were intended for some purpose, and to set about utilising them as best they knew how. They could not *write* their theories, so they *did* them.

CONCLUSION.

It seems, therefore, on a full and careful review of the "Rude Stone Monuments" of Cornwall, that their main object and intention is sepulchral. That such sacredness as attaches—or rather did attach—to them, comes of their connection with the spirits of the dead, regard for whom is an integral feature of all primitive religions, so far as we have any knowledge. And if it appear strange that we should be acquainted with a long vanished race, chiefly through its customs of burial, we should

remember that whether among savage or cultured people, death is the most solemn fact in human history. Respect to the remains of the dead is the very keynote of such great historical cults as those in Egypt and Greece and Rome—faiths, moreover, which held untiring sway in all the phases of social life. On the due performance of the funeral rites the future of the deceased was held mainly to depend. And whatever else Christianity rejected of Pagan custom, that idea was so thoroughly absorbed that its influence is patent yet. So strong, moreover, was the continuance of the outward feeling of respect, that the violation of sepulchres was one of the chief grounds of divorce accepted among the Christians of the Roman empire. Nor can we doubt that such sentiments and practices were themselves survivals from far earlier days. Nor should we question that among the races with whom they originated, or by whom they were handed down, were the simple neolithic folk who, spreading from the East along either shore of the Mediterranean—as their remnant works still testify—found their way, at length, to these western isles, long before the advent of Kelt or of Saxon, and left behind them these memorials, which have always roused the wonder of the ignorant, and continue a perpetual stimulus to the curiosity of the learned. Where record is wanting the abiding facts of human nature are our safest guides.

SOME NOTES ON THE PELAGIC LIFE OCCURRING IN THE
SEA NEAR FALMOUTH, WITH FAUNA NOTES OF THE
DISTRICT.

From January to September, 1893.

By RUPERT VALLENTIN.

The remarks I have to offer relating to the Pelagic Life occurring in the sea near Falmouth, for the last year, are of a very fragmentary nature. This is partly due to the late Fishery Exhibition held at Truro last July and August, and also to my leaving early in September for Germany.

My thanks are again due to Mr. Cunningham for some valuable suggestions, to be noticed later; and also to Mr. Garstang for naming a specimen of *Anemone* of exceptional interest. To Mr. A. F. Bealey, I am deeply indebted for his kindness, in making a series of tow-net gatherings some miles away from this port during the early part of the year.

PELAGIC LIFE

January. During the early part of this month the surface temperature of the sea was very low, being only 44·9 F. on the 2nd. A small number of each of the following forms were observed in the surface-gathering made on that morning:—*Cyphonautes*, *Eurtepe gracilis*, *Corycæus anglicus*: three specimens of *Centropages typicus* and six *Appendicularia* were also secured. On the 10th, after gales of wind from the east and south-east, the surface temperature fell to 44° F. The only forms of interest noticed in the gathering, were numbers of *Corycæus anglicus* with the frustules of a species of diatom attached to the cuticle. In some instances these frustules were so very abundant that one had extreme difficulty in viewing the segments of the crustacean. On the 21st, a few specimens of spinid larvæ appeared in the gathering, for the first time, and

on the 27th, the ova of *Nerine cirratulus* were captured. For a full description of the early stages of this species, I must refer the reader to a paper by Mr. Cunningham and Mr. Ramage (2).* I separated some of these ova from the gathering, and by placing them in a pan of sea water was able to study their development for some days; but curiously enough I was unable to rear the larval forms beyond the stages described by those investigators.

About this time my friend Mr. Cunningham suggested, in a letter, the desirability of trying to form some estimate of the quantity of surface-life in the sea. He advised that the net should be used in the usual manner, kept down for a fixed time, then hauled in, and the contents of the gathering strained through muslin and weighed. Various methods have recently been tried by Zoologists to arrive at some definite conclusions as to the quantity of life in a given area of the sea. Of course my results are by no means as accurate as I could wish, for to keep a fixed pace in a boat, unless steam be employed, is impossible; still I tried, as far as I could judge, to keep my small rowing boat and, later, my canoe progressing at a given pace through the water when surface netting. I have recorded my results in grammes, as being the most convenient form to use.

February. On the 7th the only forms of interest in the gathering were quantities of *Sagitta*; the total weight of the gathering being 1·3 grammes.

For some time past I had been anxious to compare the surface life occurring some distance from the land with that near the shore. Of course it was not possible for me except on rare occasions during settled weather, to venture far out in my canoe; and boat hire would be far too expensive. Fortunately Mr. A. F. Bealey very kindly at this time offered to work a tow-net and take surface temperatures from his yacht 'Constance' if I provided the necessary net and bottles. On the 9th of the month he made his first gathering and worked the net from 12·50 to 1·10 p.m., Manacle Buoy bearing north one mile, surface temperature at that time being 48·3 F. In this gathering the

*These numbers refer to Bibliographical list at the end.

following forms were noticed : *Sagitta*, *Centropages typicus*, and *Oithona Spinifrons* were all fairly abundant; about six specimens of *Corycæus anglicus* and one living *Muggiœa atlantica* were also observed. In addition to these forms I noticed suspended in the water some highly refractive bodies resembling in a marked degree minute fragments of mica. Microscopical examination at once shewed that there were present in the water immense quantities of a species of diatom belonging to the genus *Amphipleura*. On the 9th, the total weight of the inshore gathering was 0·3 grms, and the surface temperature 47° F. On the 13th, the only form of interest observed was that of some large *Sagitta*; a specimen taken at random measuring 14 m.m. in length. On the afternoon of the 14th, I made a short tow-netting trip, after a gale of wind from the S.W. I found in this gathering, in addition to the usual forms, four specimens of a species of Radiolarian. Unfortunately they were all dead, but still they were clearly recognizable. On the following day Mr. Bealey made a gathering two miles south east of the Lighthouse, surface temperature, at 1·30 p.m., being 49° F. I found in this gathering two specimens of the interesting shrimp with luminous organs *Nyctiphanes Couchii*, and one example of *Muggiœa atlantica*. It is curious to notice the absence of Radiolarians in this gathering, for I certainly expected to find some. On the 21st, the wind was from the W.N.W. and surface temperature 48° F. In this gathering one specimen of the ephyra stage of *Aurelia* was detected for the first time; the total weight of the gathering being only 0·1 gm. The next day (22nd) Mr. Bealey made a gathering with the surface net off Coverack about noon, the surface temperature at that time being 49° F. The captures made on this occasion were very numerous, the following forms being observed. Several specimens of Siphonophore *Muggiœa atlantica* 3 m.m. in length; *Clausia elongata*, *Dias longiremus*, *Centropages typicus*, and *Corycæus anglicus* were all abundant. On the 25th, after fresh east winds for the preceding two days, the net was worked across the rising tide off the Black-Rock; my reasons for working the net there, were mainly due to the fact that I noticed numerous gulls in the neighbourhood. Keeping the net down the usual period of

twenty minutes, I was astonished to find when drawing it in at the end of that time what an enormous haul of specimens I had made. Microscopical examination however soon shewed that nearly the whole gathering consisted of *Clausia elongata* with a few specimens of each of the following :—*Dias longiremus*, *Sagitta*, and the young of (probably) *Gobius niger*. Treating this gathering in the usual manner I found it to weigh 27.2 grms. Surface temperature 45° F.

March. On the 3rd of this month Mr. Bealey made a gathering from 2.10 to 2.30 p.m. The Lizard just open of the Blackhead, Manacle buoy bearing N.W., surface temperature being at that hour 48.6° F. In this gathering I noticed one specimen of *Podon intermedius*, whilst *Oithona spinifrons*, *Thaumentias octona*, *Corycæus anglicus*, and *Calanus finmarchius* were all abundant. *Clausia elongata* were also numerous, several females having ova attached. On the 10th, I worked the tow-net three feet from the bottom, in the main channel in the harbour, where the water averages 17 fathoms in depth. In this gathering various species of spinid larvæ were abundant, and (with them) advanced individuals of *Nerine cirratulus*. Two specimens of *Evadne Nordmanii* with ova, one *Podon intermedius*, and quantities of *Ceratium tripos* were also observed. In the surface net *Auricularia* larvæ were abundant, and a trace of the gelatinous algæ noticed for the first time this year. On the 13th, at 10.30 a.m., the surface temperature was 49° F. On the 14th, a single Radiolarian was the only interesting form observed in the gathering. On the morning of the 23rd, while out in my canoe under easy sail, I noticed large quantities of a species of copepod being swept up the harbour by the rising tide. These forms occurred in such abundance in places that I was able to ladle them out with a collecting bottle. Microscopical examination showed these forms to be exclusively *Temora longicornis*. The only form of interest secured in the gathering made that morning was a single specimen of *Ceratium fusus*. S. Kent (5) notes the capture of some of these specimens off Falmouth during July, 1879. This was the first and is the only occasion on which I have captured this species of Infusorian during my residence here. By the 27th of the month the surface temperature had risen to 51.9° F. In the surface gathering, *Auricularia* larvæ

were more numerous than ever, and with them I noticed large quantities of a low species of algæ, which I have been unable to identify. On the 28th, a single specimen of *Arachnactis albida* was detected. Since the 13th of this month I had ceased to weigh my surface gathering, owing to the increasing quantity of the gelatinous algæ in the sea.

April. On the 6th, the surface temperature was 51·6° F. and by the 11th it had risen to 52·3° F. On the 13th, I took with a hand-net large numbers of a species of *Thaumentias*. Various species of *Plutei* also abounded in the sea at this time. On the 20th, the surface temperature had risen to 53·9° F. and by the 24th of the month to 55° F.

May. During the early part of this month specimens of *Aurelia aurita* were very abundant in the sea. During this time I examined the gonads of several specimens of this species and invariably found them in a ripe condition. On the 4th, the surface temperature was 54° F. On the 9th, several small individuals of *Hormiphora plumosa* were secured, and with them numerous larvæ of *Polychæte* worms. On the 13th, the surface temperature was 55·9° F. Large numbers of *Ceratium tripos* were observed present in a small gathering made on that morning. On the 17th of the month the surface temperature being 56·3° F., *Ascidian* tadpoles were noticed for the first time. At this time numbers of the veliger stage of a species of mollusk were caught. From the comparatively large size of these larval forms I am inclined to imagine they were the larvæ of *Pleurobranchus*. An attempt was made to rear some of them but it was not successful. On the 22nd, the surface temperature had changed but little, being at the usual time 56° F. It was noticed that the gelatinous algæ had decreased in quantity very much on that morning. On the 24th, several late stages of the larva of *Synapta* were secured. An individual taken at random measured 4 m.m. in length. *Hormiphora plumosa* continued to be present in great abundance. On the 30th, a single living specimen of *Muggiœa atlantica* was secured. It will be noticed that although specimens of this siphonophore occurred in gatherings made some distance from land, it was not till the end of the month that examples occurred near the shore.

June. Three specimens of *Sarsia pulcher*, and one *Polygordius* larva were captured on the 2nd; surface temperature on that morning being 56.6° F. On the 6th, the surface temperature had risen to 57.6° F. Various species of spinid larvæ formed an important feature in the tow-net gatherings made this month. On the 9th, specimens of *Muggioea atlantica* were again noticed. On the 13th the surface temperature had risen to 62° F. Several young individuals of *Monstrilla rigida* were detected. On the 21st, the surface temperature had risen to 62.3° F. At this time *Lizzia octopunctata*, and *Sarsia prolifera* were very abundant in the tow-net. On the 29th, after strong S.W. and W. winds several specimens of *Salpa* were noticed in the gathering made on that morning.

July. On the 1st of the month, surface temperature was 60° F. In the gathering made this morning several *Salpa democratica* were again noticed. These specimens were large in size and measured from 10-13 m.m. in length. Fortunately on that afternoon Mr. H. S. Tuke paid me a visit in my hut, and on showing him some of these Tunicates he at once exclaimed, "What are they? I saw shoals of them in the sea off the Scilly Islands on the 7th of last month and wondered what they were." A short time later, while showing some of these specimens to some fishermen, during the Exhibition, they at once informed me that early last May while fishing 40 miles S.S.W. of the Dodman, they noticed enormous quantities of what I imagine to be the same species of Tunicate. They gave such a good description of the chains and colours of these animals, that I had little doubt left they had been fishing amid quantities of these Tunicates. It will be noticed from Mr. Tuke's statement that these animals took nearly a month to come from the Scillys to Falmouth. Probably the strong W. and S.W. winds we had, on the 27th and 28th of the preceding month, drove these forms into the current which I imagine runs from Land's End to the Lizard, and from thence into our bay and harbour.

It is a matter of extreme regret to me that there is no accurate information published concerning the currents of our Cornish shores, other than the brief notes in sailing books and Admiralty charts. It would well repay any one, living in the

neighbourhood of Land's End, to make a series of surface nettings, and report on the captures obtained. Another observer, stationed at St. Ives, Newquay, or Padstow, would also render great service by observing the various forms of life on the North coast. I simply mention this with the hope that some member of this Society may be induced to devote some attention to this interesting study: for I am convinced that our fisheries will be greatly benefitted by the results so obtained.

On the following afternoon I was about a mile south of the Black-Rock in my canoe, and about 5 p.m. the wind fell light, and in half an hour there was a complete calm. As I happened to lean over the side of the boat I soon saw some Tunicates being swept past me by the rising tide, and in about half an hour I found myself surrounded by innumerable quantities of these animals. As the sun was shining brightly at the time these specimens of *Salpæ* presented a charming sight, the iridescent chains sparkling in the sunshine.

To enable one to form an idea of the numbers present, I dipped a quart collecting-bottle into the sea, and on counting the number of animals secured I found seventy-five specimens present. By the 5th, the surface temperature had risen to 62° F. On the 8th, the temperature remained unaltered. In this gathering only a few Tunicates were observed. The wind being from the North had swept most of the pelagic forms to sea again. On the 9th, three young specimens of *Amphioxus lanceolatus* were secured in the tow-net, the largest specimen measuring 5 m.m. in length. On the 15th, I worked the surface-net at 4 a.m. a mile south of the Black-rock, there being a calm at that time and the tide on the flood. I found in this gathering that *Corycæus anglicus* with ova attached, *Muggiœa atlantica*, and *Cyphonautes*, were all abundant. Amongst the rarer forms may be mentioned six *Willsia stellata*, and four *Sarsia gemmifera*, and several *Monstrilla rigida*. On the 27th, I managed to make a short surface-netting trip in the afternoon, surface temperature, at 3.30 p.m., being 59.6° F. In this gathering large numbers of *Muggiœa atlantica* were again noticed, and a few individuals of *Podon intermedius* detected.

August. In the gathering made on the morning of the 1st, I found quantities of a species of Radiolarian in a living condition. During the past winter I have been able to submit these specimens, and others previously mentioned, to the inspection of Prof. Hertwig. He informs me that they are all one species viz. *Acanthometra elastica*. On the 16th, the surface temperature at the usual time, 10 a.m. was 63° F, this being the highest I have ever recorded. The Radiolarians were again abundant in the gathering made on that occasion. On the 22nd, *Podon intermedius*, with the large winter egg, was noticed. On the morning of the 29th, at 5.30 a.m., the surface-net was worked across the rising tide off the Lighthouse. In this gathering a single specimen of *Doliolum* was found, and I spent the remainder of the day studying its anatomy. On the 31st, the Radiolarian *A. elastica*, was more abundant than on previous occasions; a few specimens of *Noctiluca* were also noticed. The absence of *Noctiluca* from surface gatherings during the past two years is very singular. In my report for the year 1890 (6) I recorded shoals of this Infusorian in the sea here. Another form, *Tomopteris*, has not appeared in surface gatherings since that year.

September. After strong E. to S.E. winds I found in the gathering made on the 5th a fair quantity of *Noctiluca miliaris*, and with them a number of the Radiolarian previously recorded.

FAUNA NOTES.

Anthozoa. On the 5th of June the day was spent dredging in the neighbourhood of the Vilt buoy. Amongst the material brought back to my hut on that occasion were some old oyster shells, on which I fancied I could detect some strange forms. Careful examination shewed I was not mistaken, for I found attached to the valves several specimens of a form quite unfamiliar to me. Being unable to identify the animals, from any of the books in my possession, I wrote to Mr. Garstang, forwarding with the letter some rough drawings, and he at once replied as follows:—"Your animal is clearly *Gonactinia prolifera*, M. Sars., the most interesting anemone in existence. It has not been taken on the British coasts, but is recorded from

Norway and France. Drs. Blochmann and Hilger (1) six years ago published a very full anatomical description of this Actinian. The most unique feature in connection with this species is its mode of increase by transverse fission.

The method is as follows:—an annular constriction appears in the region of the posterior third; buds being formed just beneath this which eventually surround the mouth of the parent and form the tentacles, meantime this constriction rapidly increases, and the anterior portion is cast off, a perfect animal. M. Sars once noticed three connected individuals. I have carefully followed this interesting method of fission through all its stages, and can fully confirm the statements of previous investigators. There is one point, however, in the anatomy of this animal to which I should like to direct special attention. Drs. Blochmann and Hilger loc. cit record the presence of "sixteen tentacles, in two rows of eight each." In my specimens I find the number of these tentacles to vary exceedingly. In three specimens I found the number of tentacles to be as follows: 10, 11, and 16, respectively; and in a specimen secured since my return from Germany only 14 tentacles were present. I am now engaged in studying the anatomy of this species of anemone, and I hope at some future date to offer some further remarks on its anatomy.

Polysoa. On the 14th of July, Mr. Bealey gave me a stone about four inches in diameter which he had obtained from some long-line fishermen. He informed me "it was dragged up, off the Lizard." I found attached to this stone, near the centre, a beautiful specimen of *Porella lævis*. In size it was unusually large being $3\frac{1}{2}$ c.m. in height, and the spread of its branches 5 c.m.

There were no less than four specimens of the anemone *Caryophyllia Smithii* on the same stone, and one *Caryophyllia* had upwards of seven specimens of the parasitic barnacle *Pyrgoma Anglicum* on it. Mr. Gosse says concerning this barnacle as follows:—"two are sometimes found on the same coral."

Mollusca. On the 13th of January, when making my periodical examination of the coal hulks moored near my hut,

I found specimens of *Goniodoris castanea* still abundant on them; but by the 28th of February there was only a single individual left. On the 30th, while collecting in my praam I was fortunate enough to see a specimen of *Pleurobranchus membranaceus* swimming through the water. Mr. Garstang (3) says, referring to the curious method of propulsion this mollusk adopts, as follows:—"When swimming freely the animal is generally upon its back, but sometimes turns over either partially or completely. It moves slowly forwards in this way, alternately flapping, with wave-like contractions, from before backwards, the two halves of its broad foot. The mantle-flaps assist also in this action." The specimen I had under observation for five minutes seemed to me to expend a vast amount of energy and to obtain nothing in return. It swam nearly around my praam, and, seemingly having exhausted itself, sank slowly to the bottom in three fathoms of water amid a forest of *Zostera*. So far as I could see, the mollusk swam in the manner so accurately described by my friend Mr. Garstang.

On the 7th of March, a single specimen of *Dendronotus arborescens* was seen on the coal hulks. While collecting at Helford on the 19th of that month, I was unable to find a single specimen of *Æolis papillosa* on the mud banks; on the other hand large specimens of *Aplysia* were fairly numerous.

On the following day, while collecting in my praam under the eastern breakwater, I noticed a specimen of *Cyprœa Europœa* hanging from one of the beams extending across that structure. Close examination shewed that this mollusk was suspended from the beam by a single thread of mucous, which was fixed to the base of a large compound Ascidian; the distance between the mollusk and the beam being eleven and a quarter inches, and from the head of the gasteropod to the sea six inches. This mollusk weighed 0.4 grm. There was a fresh easterly wind blowing at the time, accompanied by bright sunshine.

Owing to the dryness of the atmosphere, I imagine the gasteropod wished to moisten its gills with sea water, for it must have been exposed to the air for at least an hour and a half when I discovered it, hence I imagine this mucous film was secreted.

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Obituary.

Losses by death having occurred since the presentation of the Council's Annual Report for 1894 (published in this present number of the Journal), obituary notices will appear in the Report for 1895, now in the press. Amongst these the Council deeply regrets to have to record the demise of the Society's Ex-President, Sir John Maclean, Kt., F.S.A., F.R.S.A., the well-known Cornish historian,—for many years an Honorary Member and contributor,—which took place at Clifton on the 5th of March, 1895. A paper from Sir John's pen is included in the present issue.



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